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Project title: A review of the literature into effective practice in teaching literacy through braille

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Contents

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Executive summary

In September 2010 the RNIB 'Evidence and Service Impact Team' presented a research brief entitled "A review of the literature into effective practice in teaching literacy through braille". This brief clearly set out the research aims and objectives for the commissioned piece of research. The requirements can be summarised as follows:

1. Literature review: Identify evidence-based good practice in the area of teaching literacy through braille
2. Collation of relevant 'braille reading schemes'
3. Application of findings to the UK context (with a particular emphasis upon mainstream placement)
4. Presentation of findings to maximise impact upon educational practice and teacher training

A team from the Visual Impairment Centre for Teaching and Research (VICTAR) at the University of Birmingham successfully applied to carry out the work. The research was carried out between January and May 2011.

Approach and method

The objectives of the research project broadly mapped onto two related, but separate, pieces of work:

- a collation of relevant UK- based braille reading schemes,
- a review of relevant literature.

The collation of UK-based braille reading schemes involved:

- the gathering a list of available reading schemes based upon the authors' knowledge and internet searches;
- checking the completeness of this list through liaison with the project consultants, and a survey of 31 teachers.

The literature review required more careful consideration mainly because of the large volume of literature that exists on the teaching and learning of literacy through braille and the limited resources which were available to the project. To aid with the review, following an initial scan of literature related to braille since the year 2000, the authors generated four research questions that they felt reflected key contemporary issues

facing teachers, and met the specifications of the review laid out by RNIB:

- Question 1: Phonological training. What phonological training do blind children and young people need to support the development of their literacy through braille?
- Question 2: Uncontracted and contracted braille. Should we start by teaching un-contracted or contracted braille?
- Question 3 Technology for braille users. What is the relationship between advances in technology and the development of learning through braille?
- Question 4: Assessment and choosing media. What are the key criteria for deciding whether braille is (or is not) an appropriate route for literacy for a child or young person?

This report presents the findings from this work.

Finally, the authors drew together the evidence described above to construct resource and practice implications. Specifically, the authors were concerned with the implications of the review findings for braille teaching and assessment resources (e.g. reading material, reading schemes, technology, braille assessment tools) and professional training. The recommendations drawn from this process are presented below.

Key findings

Question 1: Phonological training

- There is general support in the literature that phonological instruction is beneficial for beginning braille readers and that there are key similarities in the underlying processes of reading development for Braille readers and print readers
- There are some concerns in the literature that the logographic nature of contracted braille complicates the development of phonological skills and this has been taken as evidence in favour of uncontracted braille. However, further research is needed to substantiate this claim

Question 2: Uncontracted and contracted braille

- Although there are arguments for both the early and late introduction of contractions, sufficient empirical evidence does not yet exist to resolve the debate conclusively. It seems there is only general

agreement that instruction needs to focus on reading processes, regardless of how or when contractions are introduced.

Question 3 Technology for braille users

- There is no evidence in the research literature to support the view that technology has an adverse effect on the development of literacy through braille, or that it reduces the relevance of braille literacy skills.
- There is surprisingly little research into the potential of digital technology to support the development of early literacy through braille. The evidence does suggest that digital technology can play a key role in supporting the consolidation of braille literacy skills.

Question 4: Assessment and choosing media.

- The accurate assessment of literacy performance is important for informing literacy teaching.
- Deciding whether Braille is an appropriate route to literacy is complex and involves many issues. The re-development of the 'Learning Media Assessment' would be a useful step forward in helping to inform decision making.
- The choice of reading media for children with additional learning difficulties presents particular challenges.
- Learning to read through Braille and print in combination appears to be a legitimate, successful and sensitive route to literacy for some children and young people.

Recommendations

The recommendations are gathered under four headings:

- **National/regional providers.** These recommendations focus upon policy makers and lobbying groups. This includes voluntary organisations (e.g. RNIB, NBCS), government and related agencies, organisations responsible for writing standards and guidance, and teacher groups (e.g. VIEW). It also includes producers of braille teaching resources and publishers.
- **Training providers.** This includes teacher trainers, teaching assistant trainers, and organisations that provide inset training and professional development generally.
- **Local education services.** This includes visiting teacher and support services, schools, teachers and other professionals involved in directly supporting literacy education through braille.

- **Other issues.** This covers other general issues including topics we do not believe have been covered in this report (but are linked to the teaching of literacy through braille), and this includes topics which warrant further investigation.

National/regional providers

Recommendation 1: Standards and guidelines for services and schools for teaching literacy through braille would be helpful. These could build upon the existing 'Quality Standards in Education Support Services for Children and Young People with Visual Impairment' (see DfES 2002), and in line with the Quality Standards for Special Educational Needs (SEN) Support and Outreach Services (see DCSF 2008) adding additional guidance in relation to the teaching of literacy through braille.

Recommendation 2: Guidance and resources for teachers are needed regarding teaching literacy through braille generally, and on decision-making in relation to the introduction of the contracted and uncontracted code in particular. Based upon available evidence and the UK education context, the authors believe that unambiguous guidance about using uncontracted braille for teaching literacy through touch would be helpful. Teaching resources for teachers who choose to introduce literacy through uncontracted braille are also required, including guidance relating to when and how to introduce braille contractions. This recommendation particularly lends itself to the development of an online 'portal' of resources for teachers.

Recommendation 3: The development of a practical and readily available assessment procedure (or 'rubric') for supporting decisions about choice of primary literacy media would be helpful. Any such assessment (and related options/recommendations it provides) should make reference to the role of technology. Given recent work by RNIB, a developed version of the Learning Media Assessment (LMA) (Koenig and Holbrook, 1995) may be helpful.

Recommendation 4: A decision should be made quickly about the uptake of Unified English Braille (UEB) in the UK. This needs to take place before the development of the new resources recommended in this report.

Recommendation 5: The development of a braille reading scheme which is specifically designed for use in mainstream classrooms is needed.

Recommendation 6: Linked to the development of a braille reading scheme is the general issue of assessment of progress of children's literacy through braille. In particular, a strategy is needed to make available a new edition of the Braille Neale Analysis of Reading Ability (NARA). (The current version of the NARA is currently being re-printed and re-stocked by RNIB.) Careful thought will be required to ensure a meaningful assessment exists which is in line with other policy decisions (most notably UEB, and contracted/uncontracted braille), while also being mindful of the cost and time implications of re-standardising this test.

Recommendation 7: Consideration be given to the development of a nationally recognised braille curriculum and the promotion of recognition/accreditation of braille skills in national assessments.

Training providers

Recommendation 8: Appropriate and timely professional training is required for those teaching children literacy though braille. Example developments to existing training might include:

- The review and possible revision of approaches in existing training programmes in relation to teaching literacy through braille;
- The creation of additional credit bearing and non-credit bearing courses for teachers and teaching assistants in this area;
- Second level training for QTVIs;
- Interactive resources and guidance at a publically available location such as a web portal.

There are a variety of providers who might be involved in this process including existing providers of training programmes.

Local education services

Many of our draft recommendations are linked to the development of guidelines and resources. Implicit in this is a belief that educational services should follow these guidelines, i.e. have clear decision making

processes for deciding on contracted / uncontracted code, embedding phonological training in pre-school and KS1 education, etc. Ensuring consistency of approach between different schools and local authorities will require the development of a professional infrastructure which currently does not exist.

Linked to this is 'who' does the teaching (a good question asked by reviewers of the previous draft of the report). Unsurprisingly, there do not appear to be any studies which explore 'different professional involvement' as a variable in relation to outcomes teaching literacy through braille (although there are some more general studies and 'expert views'). Perhaps inevitably, the ABC study concluded the importance of consistent high quality teaching as a key factor for good progress in literacy through braille. Nevertheless, research studies (into literacy generally, not just literacy through braille) tend not to address such 'large' / 'policy' research questions directly. On this issue it might be helpful to discuss comparisons with what might be expected for the teaching of literacy to sighted children. We would expect sighted children to be taught literacy by teachers qualified and trained to do so, therefore it would be logical to expect the same for children who are taught literacy through braille. It seems important to emphasise that learning literacy through braille is not just an issue of 'access' through a different code. Children developing literacy through braille require specific pedagogical approaches that are different from those required by print readers and therefore the class teacher in a mainstream classroom requires support from specialist teachers with a sophisticated knowledge of the issues.

Other issues

Recommendation 9: The particular needs of children who learn braille having already learnt to read through print have not been explored in any depth in this review. It may be that the development of further resources is needed, but this requires further review and clarification.

Recommendation 10: The particular needs of children with learning difficulties / complex needs and how they could be taught literacy through braille have not been explored in any depth in this review. It is likely that more research is needed into the efficacy of different 'functional' approaches to teaching which may be suitable for these children and young people.

1 Introduction

In September 2010 the RNIB 'Evidence and Service Impact Team' presented a research brief entitled "A review of the literature into effective practice in teaching literacy through braille". This brief clearly set out the research aims and objectives for the commissioned piece of research. The requirements can be summarised as follows:

1. Literature review: Identify evidence-based good practice in the area of teaching literacy through braille
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4. Presentation of findings to maximise impact upon educational practice and teacher training

A team from the Visual Impairment Centre for Teaching and Research (VICTAR) at the University of Birmingham successfully applied to carry out the work. The research was carried out between January and April 2011.

2 Research questions

The objectives of the research project broadly mapped onto two related, but separate, pieces of work:

- a collation of relevant UK- based braille reading schemes,
- a review of relevant literature.

The collation of UK-based braille reading schemes was methodologically relatively straight forward and is described in the next section. In summary, it involved:

- the gathering a list of available reading schemes based upon the authors' knowledge and internet searches;
- checking the completeness of this list through liaison with the project consultants, and a survey of 31 teachers.

The literature review required more careful consideration mainly because of the large volume of literature that exists on the teaching and learning of literacy through braille and the limited resources available to the project. To aid with the review, following an initial scan of literature related to braille since the year 2000, the authors generated four preliminary research questions that they felt reflected key contemporary issues facing teachers, and met the specifications of the review laid out by RNIB. An additional supplementary question related to the implications of literature review was also included. Inevitably, the decision to restrict the focus to these questions meant that some important areas such as specific literacy difficulties (dyslexia) and the role of tactile illustrations in relation to braille reading could not be addressed in any detail in the review.

Question 1: Phonological training

What phonological training do blind children and young people need to support the development of their literacy through braille?

Rationale for question:

- Phonics and phonological awareness is a key strand of mainstream approaches to teaching literacy in UK schools (e.g. see current guidelines presented for literacy strategies in England and Wales presented at:

http://nationalstrategies.standards.dcsf.gov.uk/, and 'Letters and Sounds', DfES, 2007).

- There is a strong consensus that phonological awareness is important for those learning to read through braille in the literature. This is reflected in recent journal articles on the teaching/learning of literacy through braille in both the USA and the UK.

Question 2: Uncontracted and contracted braille

Should we start by teaching un-contracted or contracted braille?

Rationale for question:

- This is a contemporary question since some local authorities in the UK appear to be adopting a braille literacy teaching strategy which involves *only* introducing contractions once basic reading has been established.
- Teachers supporting children in mainstream schools need to know what are the potential benefits or drawbacks of starting instruction in uncontracted braille, and at what point, if any, contractions should be introduced.
- This question also has strong policy implications for braille production, braille assessment and professional training.

Question 3 Technology for braille users

What is the relationship between advances in technology and the development of learning through braille?

Rationale for question:

- The ability to access the rising volume of electronic information available at school and in the home is increasingly becoming a requirement for successful educational and social development for all children.
- Braille users in mainstream contexts are likely to require facility in using both braille and QWERTY keyboards for recording and accessing information as well as familiarity with print conventions such as layout, punctuation and spelling.
- For children who are blind, information in digital form can quickly be manipulated into accessible formats. However the assumption that the ease with which digital information can be manipulated

into speech means that blind children are now less reliant on braille needs careful examination.

- This research question also addresses the related issues of whether advances in technology make the development of literacy through braille less important, what role technology can play in the development of literacy, and what technological skills and equipment are needed by children who use braille. It will also briefly consider the potential impact of the introduction of the Unified English Braille Code which is designed to make it easier to translate (through the use of computer software) contracted braille to print and print to braille.

Question 4: Assessment and choosing media

What are the key criteria for deciding whether braille is (or is not) an appropriate route for literacy for a child or young person?

Rationale for question:

- The question captures the issues of choice of primary literacy medium, dual media, and decisions about transfer between media and considers how such decisions should be reached.
- It also relates to the assessment of progress including consideration of alternative routes to literacy for children who experience difficulties in reading through braille that may be linked to additional cognitive and/or physical impairment.

Question 5: Resource and practice implications

What are the implications of the review findings for braille teaching and assessment resources (e.g. reading material, reading schemes, technology, braille assessment tools) and professional training?

Rationale for question:

- This is an opportunity to apply the results of the literature review and the collation of reading schemes to practice in the classroom and to the formulation of policy. This is especially important given that the research specification explicitly sought to “maximise impact upon educational practice and teacher training”.

3 Method

The methods associated with the literature review and collation of the reading schemes are presented below.

3.1 Literature review

This literature review builds upon a more general review carried out in 2008 and reported in Douglas et al (2009). That review was concerned with education and visual impairment more generally but did include a section relating to braille. We adopted a similar approach to that which was undertaken in the 2008 review: Stage 1 was a hand search of relevant journals which contain much of the empirical literature in relation to braille (this hand search specifically looked at articles since the year 2000 and focused particularly on two international journals: the *British Journal of Visual Impairment*, and *Journal of Visual Impairment and Blindness*). Stage 2 involved broader systematic searches of electronic databases (see below) to confirm, add to and (possibly) challenge and "test" the initial analyses. Not surprisingly, stage 2 overlapped considerably with stage 1; nevertheless it did identify some additional useful sources.

The University of Birmingham's e-library service allows access to a number of bibliographic databases with advanced search capabilities. The following databases were searched for literature relating to the teaching of literacy through braille:

- Dialog DataStar, which included databases: ERIC (Education Resources Information Center), British Educational Index; Australian Educational Index.
- CSA Illumina, which included databases: ASSIA (Applied Social Sciences Index and Abstracts), Education – a SAGE Full-Text Collection; Social Services Abstracts; Sociological Abstracts
- OVID, which included the database: PsycInfo.

The following search terms were used:

To define abstracts relating to *children* (the OR Boolean operator was used, as they are alternative terms): child / children; student(s); pupil(s); pre school; kindergarten; youth.

To define abstracts relating to *visual impairment* (the OR Boolean operator was used, as they are alternative terms): visual impairment / visually impaired; partial sight / partially sighted; low vision; blind / blindness; MDVI or multiple disabilities.

To define abstracts related to reading through braille: (literacy OR reading) AND braille.

An asterisk was used for truncation in some of the databases for quicker searching: for example, “visual* impair*” would find instances of “visual impairment” as well as “visually impaired”, and “child*” would find articles with “child” and “children” as well as other possible variations of the word. Therefore the overall search term was as follows:

(child* OR youth OR pre school OR kindergarten OR student OR pupil)
AND
(visual* impair* OR partial* sight* OR low vision OR blind* OR MDVI)
AND
(literacy OR reading)
AND
(braille)

The literature generated through this process was applied to answering the research questions described above.

3.2 Reading Schemes

The braille reading schemes readily available in the UK had already been collated by RNIB and presented on their website. The project provided an opportunity to seek the views of those in involved in teaching literacy. Given the limited project resources available, an online survey of professionals was undertaken. The questionnaire asked participants to describe their use of the available reading schemes (Feeling Ready to Read; Braille for Infants; Reading Together; Braille in Easy Steps; Take Off; Abi books; Get Going; Oxford Reading Tree). While the questionnaire asked about the forthcoming ‘Hands On’ scheme, no participants had yet used a trial version of the scheme. Participants were asked to provide information on perceived strengths, weaknesses as well as general evaluative comments in relation to each scheme. Participants were also asked to provide information about any other scheme used but not listed, as well as details about unpublished or ‘in-house’ teaching resources they had used. The authors did not identify

any published research which evaluated any of the braille reading schemes in terms of outcomes for children.

The questionnaire was presented online using 'Bristol Online Survey' (BOS) software. The respondent could link to the appropriate web address and complete the onscreen questionnaire before submitting their answers. Participants were recruited by sending an email to: (1) the 'VI-Forum' (an email discussion group concerned with education and visual impairment, see http://lists.becta.org.uk/mailman/listinfo/vi-forum) and (2) an email distribution list of approximately 120 students registered on education and visual impairment training programmes at Birmingham University. The survey took place in the last two weeks of February 2011. The findings are presented in Section 8.0.

4 Context

Although the teaching of literacy through braille has always been an important focus for those concerned with the education of blind children, there are broader issues that serve as an important backdrop to this review. These issues include:

4.1 Educational policy and practice

This includes the broader educational context for how early literacy is taught to young children and consequently, how teaching literacy through braille fits in with this. As an example, the Letters and Sounds programme (DfES 2007), which followed the Rose review's recommendation of "high quality phonics work", is now part of the Primary Framework and the Early Years Foundation Stage curriculum, and young braillists in mainstream schools are likely to be included in the structured oral phonics activities of this programme. The National Literacy Strategy (NLS), which set out a framework for the teaching of literacy to all children, continues to shape the context for the development of braille literacy in mainstream schools. However the NLS ceased to be mandatory at the end of March 2011, suggesting there may be greater variation in approaches to teaching literacy within UK schools in the future.

4.2 Theories of literacy acquisition

A related issue concerns how braille fits in with current theories of literacy acquisition by young readers. This includes for example, consideration of how to design resources to ensure they are suitably motivating for young braille readers. The approaches to teaching literacy to children through braille are described by Rex et al (1994) as falling within three broad models:

- Meaning-Centred Models. The emphasis is on the story and the approach focuses on deriving meaning at the story level, and the sequence of learning goes from the story, to the paragraph, to the sentence, word and letter-sound level. The focus gradually shifts from meaning to an understanding of the underlying elements of print.
- Skills-Centred Models. Such models assume that an understanding of the nature and rules of the underlying elements of text lead to the

development of understanding of meaning. Letters are built up into words, and words in to sentences and sentences into stories. An understanding of grapho–phonmenic relationships enables children to decode text, and break down words to reveal their meaning.

- Interactive models. These models combine elements of both of these above, acknowledging that children need to develop decoding skills within an approach that emphasises meaning and relevance. This is a common approach taken to print reading in mainstream classes.

Teaching contracted braille literacy to a child through a scheme that falls predominantly within a 'skills-centred' model (e.g. using a scheme such as Braille for Infants) ensures the child is introduced to the contractions in a structured manner, but could create tensions in terms of mainstream classroom practice (as the child is essentially following a different scheme to the rest of the class). Similarly, adopting a more 'meaning centred' approach (for example, through the use of a class print based scheme that has been translated into braille) may be viewed as being more 'inclusive' in a mainstream context, but may not allow attention to be given to the symbols which will be more easily recognised in the early stages of learning braille. The ordered introduction of braille symbols is often seen to help children by reducing the potential for confusion of reversals, inversions etc. Another potential drawback is the assumption in print schemes that the child will often decipher the meaning of vocabulary by looking at the pictures or illustrations that accompany the text. This issue is considered further in section 9 (Braille Reading Schemes).

4.3 The teaching of braille in mainstream schools

Recent empirical work in the UK provides useful information on the teaching of braille in mainstream settings. As an example, an RNIB report (Keil and Clunies-Ross, 2002) suggests that approximately 4% of children and young people with a visual impairment (5-16) use braille as their main or sole literacy format in schools in England, Scotland and Wales (approximately 850 children). The report also reveals that 83% of the primary aged children who use braille attend mainstream or resourced mainstream schools. Children who use braille are therefore relatively few in number and, significantly, do not form a homogenous group. For example, although many will be learning to read and write through braille from the start, some children with deteriorating vision may have already developed literacy through print and will be seeking to apply these skills in their new medium of braille. Further, many of the

children who use braille have additional needs. Of 85 braille users in the sample in the RNIB study, 35 (41%) had additional needs, most commonly physical disabilities or learning difficulties.

A more recent study in the UK by Bindman and Greenaway (unpublished) collected data through questionnaires from 133 qualified teachers of visually impaired children (QTVIs) who worked with 197 braille users in England and Wales about braille teaching methods, models of braille literacy acquisition, children's progress and models of service delivery currently implemented by specialist teachers in the UK. Few respondents felt they were well prepared to teach braille literacy and most admitted to having difficulty maintaining braille skills with only 11% regarding their own level of proficiency as 'very efficient' and 70% feeling it would be important to improve their braille skills (now or in the future) to teach the children they were currently working with. The authors concluded that there was a wide variation in the training and qualifications of those teaching braille in the classroom, wide variation in children's braille attainments and wide variation in the amount of braille instruction they received. They highlighted a lack of monitoring of children's progress, and a wide range of external factors as barriers to progress.

5 Question 1: Phonological training

This section presents literature which seeks to address the research question: 'What phonological training do blind children and young people need to support the development of their braille literacy?'

This particular research question draws upon a number of specialist terms and concepts which are summarised in the Glossary Appendix (i.e. phonological awareness; phonics; phoneme; grapheme; morpheme; onset and rime; CVC words).

5.1 Literature

There is general support for the view that reading in braille has much in common with reading through print (Edmonds and Pring 2006), although the potentially reduced opportunities for the incidental learning of letters and words prior to formal instruction, and the sequential nature of early reading through touch, clearly affect the reading process for children who are blind. For example, beginning braille readers in the USA were found to 'have not yet acquired the tactile proficiency in the act of reading that allows them to process groups of letters or whole words as beginning print readers can' (Emerson, Holbrook and D'Andrea, 2009 p611).

In a review of research on the development of phonological awareness by braille readers, Monson and Bowen (2008) found that research evidence to that date concerning the relationship between phonological awareness and braille was uncertain because of: the lack of commonality among the studies; the extent of contradictory findings; and the small number of studies involving beginning braille readers.

The contradictory findings are particularly apparent in relation to children in the 7-12 age range, with Greaney and Reason (1999) finding that braille readers outperformed sighted readers in phonological tests, and Gillon and Young (2002) and Dodd and Conn (2000) finding delays in phonological development compared to fully sighted children.

In a UK study, Greaney and Reason (1999) measured the phonological performance of a sample of 22 braille readers aged 7:10-12:1 years. They found that the scores achieved for each test of phonological awareness/memory were higher than those expected from the norms of

sighted children. However, in spite of this phonological superiority, the braillists did not read as well as sighted children, and Greaney and Reason concluded that progression from phonological to orthographic awareness was hard to achieve for children who were blind.

Gillon and Young (2002) compared the phonological-awareness skills of nineteen New Zealand children aged 7-15 years who were using braille as their reading medium, with those of a control group of sighted children who were chronologically three years younger but of the same reading age. They found that children who had difficulty reading braille were also delayed in their development of phonological awareness, demonstrating strengths and weaknesses that were similar to those of the younger sighted children.

A study by Dodd and Conn (2000) in the UK, asked children (average age 10:1) with and without visual impairments to segment words phonemically with and without braille contractions. They too found that braillists performed below the level of sighted children on reading measures, but also found that they performed relatively poorly on phonological awareness skills in comparison with a matched group of sighted children. In particular, they found that the participants who were blind scored lower on segmenting words that contained braille contractions, concluding that the logographic nature of braille (e.g. the fact that contracted braille symbols such as 'the' in the word 'further' can cut across phonological boundaries) affects a reader's ability to segment words phonemically and that some phonological difficulties might be related to 'the nature of contractions in braille orthography'. (p9)

In relation to young pre-school children, Barlow-Brown and Connelly (2002) noted that 'congenitally-blind children do not receive exposure to environmental print and do not generally learn to recognise written letters of the alphabet prior to schooling in braille.' (p259). In comparison, Treiman and Rodriguez (1999) found that most fully sighted children begin school able to recognise approximately 15 print letters. Barlow-Brown and Connelly found that blind children 'with no knowledge of written letters or written words showed no ability at measures of phonological awareness' whereas 'Blind children with knowledge of written letters and no written words showed much increased phonological awareness' (p259). The authors noted that letter learning is a major contributor to the development of phonological awareness in children who are blind, and phonological awareness skills develop only *after* children who are blind experience a written form of language, arguing that 'learning to recognise braille letters provides the impetus

for improvements in phonological awareness' (p267). They concluded that, whereas for sighted children knowledge of letter names goes hand-in-hand with knowing what the letter name refers to (the orthographic symbol), 'until blind children learn braille letters they can't make this connection and the development of phonic awareness is stifled as a consequence' (p267).

In a survey of the early literacy practices of 192 specialist visiting teachers of pupils with visual impairment who work with preschool children in the USA, Murphy, Hatton and Erickson (2008, p136) investigated strategies for promoting phonological awareness used by teachers. These included: singing and listening to songs, nursery rhymes and chants; reading stories with interesting sounds/rhythms; building knowledge of sound-symbol associations in meaningful contexts; inventing words that rhyme with child's name; playing with sounds in words (e.g. tongue twisters, nonsense rhymes); playing word games with children to identify beginning sounds in words; pointing out particular sounds in words when reading a storybook; emphasising the number of syllables or phonemes in spoken words (p140). The study found that most teachers did not use direct structured instruction to promote phonological awareness, such as pointing out particular sounds in words or emphasising the number of syllables or phonemes in spoken words, nor were they implementing recommended practices in early literacy such as promoting phonological awareness and the function of writing. The authors suggested that this may be for want of an access to current resources on teaching literacy, and concluded that there was a need for the development of resources that address phonological awareness skills.

Crawford and Elliott's research into phonological methods for learning to read braille involved 6 Australian braille readers in primary schools (Crawford and Elliott, 2007). Crawford found that teaching braille letters as phonemes resulted in more efficient performance than teaching braille letters as graphemes, and they reported that their work confirmed results from an earlier study with preschool blind children (Crawford, Elliott and Hoekman, 2006) which found that introducing braille words as onset- rimes 'produced statistically significant better performance in comparison to instruction in braille words as whole words' (p542). This in turn mirrored the findings of Vik and Fellenius (2007) with six primary school braille readers in Norway. This finding implies that some contractions may interfere with a style of teaching which emphasises phonic analysis, for example, simple upper word signs (such as 'p' for

people), or where contractions do not align with phonic boundaries (such ‘the’ in ‘other’ and ‘of’ in ‘roof’).

Studies of blind children in the early stages of schooling generally support the view that they match children who are fully sighted in most aspects of phonological awareness. However Emerson, Holbrook and D’Andrea (2009), reporting on the findings of the ABC Braille study, suggest that while young beginning braille readers in kindergarten and first grade (ages 4-6) did not have great difficulty acquiring basic reading skills, they began to show ‘deficiencies in acquiring higher level decoding skills’ (p621) in second grade and above (age 6+ years). The tests that focused specifically on phonemic awareness showed most children in kindergarten (75%) had acquired 5-7 of the 7 basic skills for this age range including blending word parts, blending phonemes, detecting initial sounds, and linking letters to sounds. By first grade the children had developed 7 or 8 of the 8 basic reading skills, including substituting initial/final consonants, and blends in the final position. However, when it came to applying these phonological skills to acquire higher level skills such as recognising CVC words (e.g. mat), or CVC words with a ‘Magic E’ (e.g. mate), children’s results were much less consistent. Indeed Erickson and Hatton (2007) identified specific strategies such as repeated readings, direct instruction in phonics, and big word decoding that emphasizes morphemes, as being of great benefit to school-aged children with visual impairments and blindness.

More recently, Hatton, Erickson, and Lee (2010) examined the phonological awareness of 22 young children with visual impairments and no additional disabilities aged 4-7 (average age 5.4). The study tested for syllable-segmentation, ‘sound-isolation’ (the ability to recognise onset and produce isolated sounds at the beginning of words), and sound-segmentation skills (the ability to segment individual words into sounds and phonemes) and ‘letter sound knowledge’ (the ability to identify letters and digraphs when they are written down). The study found that the phonological awareness skills of the children in the sample was commensurate with those of children who were fully sighted. It also found that within the sample of visually impaired children, potential braille readers scored better on the first three tests than potential print readers. Among the possible explanations they put forward for this finding was that potential braille readers are more attuned to the sounds in oral language than potential print readers (who may be more attuned to visual stimuli. Another suggested reason was that that parents and teachers focus more on the development of

phonological skills in potential braille readers because they realise that these children may not acquire them incidentally through vision.

Hatton et al.'s conclusions (2010) tally with earlier findings of Millar (1997, p219) who found that 'the phonological skills and preferences of young blind children should make it easier for them to learn the phonemic detection and segmentation skills that are needed for learning braille'.

5.2 Summary

There is general support in the literature for the view that phonological instruction is beneficial for beginning braille readers and importantly, that there are key similarities in the underlying processes of reading development whether a child is using braille or print. Further, there is some evidence to suggest that typically developing children who are blind compare well to children who are fully sighted in acquisition of early phonological skills, but take longer to develop higher level phonological skills and apply them to reading.

The research suggests that teachers should therefore focus on the development of activities with children who are visually impaired to promote phonological awareness from an early age. Children who are blind need to be exposed to activities that encourage them to manipulate and analyse the sounds in oral language and, crucially, to activities that begin to help them to make the link between these sounds and written braille letters and words. As children progress, phonological instruction needs to continue with particular attention given to the development of higher level phonological skills and their application to braille text.

A decisive phase in the development of phonological skills occurs before the child starts formal schooling, and while there is some evidence that blind children may have an initial phonological advantage over sighted children because of their increased reliance on auditory discrimination, their relative lack of exposure to letters in written form may hamper their ability to apply these skills to reading. There are some concerns expressed in the literature that the logographic nature of contracted braille complicates the development of phonological skills, and this is taken as evidence in favour of uncontracted braille. However, further research is required to substantiate this claim.

Question 2: Uncontracted and contracted braille

This section presents literature which seeks to address the research question: '*Should we start by teaching uncontracted or contracted braille?*'

This particular research question draws upon a number of specialist terms and concepts which are summarised in the Glossary Appendix. These terms are: 'contracted' and 'uncontracted' braille; 'two handed movement patterns' (after Wormsley, 1979) and 'hand movements'.

5.3 General reading development and contracted braille

A current debate in literacy instruction for children who are blind revolves around whether reading and writing in braille is best introduced through uncontracted braille or contracted braille. Since the 1970s contracted braille has been commonly used in the UK as the medium of instruction for young braille readers. However, as increasing numbers of young children who use braille as their main medium for literacy receive their education in mainstream settings, their literacy skills are developed within the context of a national framework for the introduction of literacy with a predominant focus on the teaching of reading through print. It is argued by some teachers that the 'letter-for-letter' correspondence with print that uncontracted braille offers, allows greater opportunities for literacy learning alongside sighted children. Another argument is based around the fact that in mainstream settings, literacy instruction in braille is often delivered by a range of non-specialists professionals (e.g. mainstream class teachers or Teaching Assistants)who may have little or no experience of supporting a braille reader (Keil and Clunies-Ross, 2002). As such, it is argued that uncontracted braille allows for greater participation of non specialists in the teaching process.

Arguments used by professionals for the use of an uncontracted alphabetic braille code are generally linked with the perceived increased opportunities for inclusion, and stress the benefits it affords for learning alongside print readers and the concomitant social benefits that arise from co-learning. It is also argued that uncontracted braille improves spelling because children learn words in the original uncontracted form, (seen as a particular benefit when writing using Qwerty keyboard technology).

On the other hand, proponents for the early introduction of braille contractions argue that it can allow 'beginning readers to take in larger chunks of text at a time and thus help them to process information faster' (Emerson et al 2009, p 611), as well as helping to avoid the teaching of familiar words in two different forms – uncontracted and contracted braille.

Hong and Erin (2004) compared the reading and spelling skills of students who were taught to read using uncontracted braille with those of students who were taught to read using contracted braille. They found no significant differences in performance over a range of skills, such as reading speed, reading accuracy, comprehension, and spelling ability, between initial instruction in the two types of braille. Nor did they find any evidence that 'changing to contracted braille later in school will impede the speed and efficiency of reading' (p335). While acknowledging that contracted braille takes up to around a quarter less space, they questioned the assumption that it increases reading rates, citing Troughton (1992).

In the UK, Clunies-Ross (2005) summarised the contemporary debates in the United States over the use of uncontracted braille, noting its increasing use with particular groups, including beginners of all ages, children with learning difficulties, mainstream teachers, and parents. She reported that uncontracted braille is generally seen as an additional option rather than a replacement for contracted braille, and it is usually introduced on the assumption that learners will make the transition from uncontracted to contracted braille at some stage in their future learning.

Clunies-Ross noted concerns in Canada about the lack of books in uncontracted braille for early learners and anxieties that there are no guidelines to help teachers of students make the transition from uncontracted to contracted braille. She also reports a "heated" debate about whether to teach uncontracted or contracted braille to beginning readers in Australia, noting that in 'integrated' classrooms uncontracted braille is perceived as easier to teach and manage, but that there are concerns that staff members who have only uncontracted braille knowledge may be unable to facilitate children's move to contracted braille.

Clunies-Ross reported claims that in Scandinavia the policy of producing all materials in uncontracted braille has increased the number of users and made production more economically viable. She concluded that the

“place of uncontracted braille is growing within the range of options on offer to blind readers” and suggested that “new groups such as older learners, very young learners, those in mainstream education, those who are adventitiously blind, children with learning difficulties and people for whom English is a second language [..] are finding it easier to learn” (p. 72).

Despite these reported claims, this review could not identify any *empirical* evidence about the relative long term effects on reading literacy achievements of instruction through uncontracted or contracted braille. Typical braille learners make the transition from uncontracted and contracted braille at some point, albeit at different rates, and even though teachers may report using ‘uncontracted’ braille, it is rare that *no* contractions enter into the child’s reading and writing. This has a confounding effect on research in this area, because of the difficulties of identifying a group of typically developing children who can read uncontracted British or American braille fluently but have no knowledge of contractions.

This confounding effect was referred to in the five year longitudinal ABC Braille Study (‘Alphabetic Braille and Contracted’ braille), which tracked the progress of 42 children in Canada and the USA who were introduced to literacy through braille (Emerson et al., 2009). Although the children’s teachers had identified their approach at the start of the study as ‘contracted’ or ‘uncontracted’, most students in the ‘uncontracted’ group *did* learn contractions, but not as many as those in the ‘contracted’ group. What distinguished the two groups was the degree of ‘contractivity’ involved in their instruction.

At the end of the study, researchers compared the progress of 5 children who had been taught fewer than 25 contractions (low contractivity) with five who had been taught all 189 contractions (high contractivity). When the reading outcomes of the two groups were measured ‘students who were reading primarily uncontracted braille were reading at much lower levels and demonstrating worse vocabulary and spelling skills’ (Emerson et al., 2009, p620) than the children in the high contractivity group. The children who were introduced to more contractions earlier in instruction performed better on virtually all reading measures including vocabulary, decoding, and comprehension and the use of contractions did not seem to impinge on fluency in oral reading.

On the face of it, this seems to suggest unqualified support for use of contracted braille from the start. However, since there was no matching

between the two sample groups in the study design, it was not possible to conclude definitively that the differences between the groups could be attributed to the introduction or non-introduction of contractions. As the findings suggested, it could be, for example, that the children in the 'high contractivity' group were introduced early to contractions because they 'showed an early aptitude for reading' Emerson et al., p621).

The argument that uncontracted braille affords more opportunities for social interaction with sighted children in mainstream settings was also investigated as part of the ABC Braille Study. Sacks, Kamei-Hannan, Erin, Barclay, and Sitar (2009) compared the social experiences of beginning braille readers in literacy activities using a mixed qualitative and quantitative design. They found no differences in the quality or quantity of social experiences over time between children introduced to literacy through contracted and uncontracted braille. Nevertheless children's level of achievement in acquiring literacy skills *was* found to be strongly correlated with the frequency and quality of their interactions with their sighted peers. They recommended that further research should be conducted to determine whether children experience more interactive social experiences in literacy as they become more efficient with braille reading and writing, and to determine if group work with peers in literacy activities influences positive social outcomes.

5.4 Hand Movements in Uncontracted and Contracted Braille

The mechanics of how children read braille have been considered an important element in determining the speed and fluency in braille reading and have been the focus of much research. Therefore the question of whether there is a difference between the patterns and characteristics of hand movements of children who used contracted braille compared to uncontracted braille is an important one.

Wright, Wormsley and Kannei-Hannan (2009) reviewed the literature on the role played by hand movements in braille reading. They identified two broad groups of braille readers: two handed readers and one handed readers. Two handed readers were divided into four sub-groups: left marks, parallel, split and scissors, depending in the nature of their hand movement style (see definitions in Appendix). The research literature provides support for the view that two handed reading is more efficient (faster) than single handed reading and that most fast readers used two hands in a scissors movement. Frequency of characteristics

such as hand pauses, ‘scrubbing’ of dots and regressions affected reading speed, and although most of these were present in all readers, they were infrequent in proficient readers.

The ABC longitudinal braille study sought to investigate whether there was a difference in the patterns and characteristics of the hand movements of children who used contracted braille and children who used uncontracted braille; whether hand movement patterns and characteristics differed according to the number of contractions introduced; and whether hand movements generally had an effect on reading rates. The results were drawn from video sequences of 38 children reading orally.

A general finding was that oral reading rates varied hugely between children in the study ranging from 4.5 to 97 words per minute (wpm) on familiar texts. Average wpm generally increased each year from just under 20 wpm in kindergarten to just over 50 wpm in the Fourth Grade. The increases became smaller as the children moved through school Grade 1: 31 wpm, Grade 2: 45 wpm, Grade 3: 51 wpm, Grade 4: 50 wpm (Wright et al., 2009).

Similarly hand movement patterns were seen to change over time. This change was less marked in the four children identified as one handed readers, three of whom retained their original hand movement pattern. 75% of two handed readers changed their patterns over time, the majority moving towards more efficient systems such as split or scissors patterns. The reading speeds of the children using two handed patterns increased at a greater rate than that of the one handed readers. Unsurprisingly, hand movement characteristics such as regressions, pauses and erratic movements were found to have a significantly negative effect on reading rates. Wright et al. concluded that there was no evidence that the introduction of contractions had any significant effect on hand movement patterns or characteristics.

Overall, the results generally supported the commonly held view that two-handed reading is more efficient than one-handed reading, and that teachers should encourage two handed reading from the start. Two handed readers generally progress to more efficient patterns as they become older, and these more efficient patterns are associated with higher reading rates. Children who start as one handed readers may be less likely to develop their hand movements compared to those starting with two hands.

However, the data from the ABC study did not support the argument that teaching contracted braille from the start increases inefficient erratic hand movement characteristics such as scrubbing or regressions. There was no significant evidence that children who used contractions had greater difficulty recognising characters (i.e. no evidence of increased scrubbing) or context (i.e. no evidence of increased regressions). Interestingly, regressions by the left hand in two handed readers were not necessarily seen as evidence of inefficiency.

In short, there is no evidence from the literature to support the view that the introduction of the additional complexity of contractions has a negative effect, and makes hand movements less efficient for beginning braille readers, but similarly there is no evidence that uncontracted braille improves efficiency of hand movements.

5.5 Spelling and contracted and uncontracted braille

The view that spelling is more difficult for children who are blind is a pervasive one among teachers. This perceived difficulty is often ascribed to the fact that children who learn to read through contracted braille have less exposure to words in their uncontracted form (e.g. ‘people’ in contracted braille is simply written as the letter ‘P’). While limited research exists into the spelling of children who are introduced to literacy through uncontracted braille, there is a considerable body of research evidence into the spelling of children who use contracted braille.

Clark-Bischke and Stoner (2009) examined samples of writing of 20 braille reading students in the USA from across the school age range with no identified additional disabilities. Fifteen of the students used contracted braille and five used uncontracted braille. They concluded that the children’s spelling skills were similar to those of sighted students. The assessment focused on the number of words spelled correctly and used an error analysis to describe patterns of spelling errors. A distinction was made between spelling errors that were the result of ‘braille errors’ (e.g. braille-specific errors such as cell reversals, missing dots) and spelling errors that are not the result of braille errors.

The authors note that remediation of spelling errors depends on identifying a pattern to the errors and analysing it. They also suggest that improved phonological skills can help reduce misspellings. The study refers to earlier work by the authors (Clark and Stoner 2008) which found that the ability to identify and correct braille errors increases

children's accuracy in spelling, and argued that proofreading should be encouraged from an early age. This earlier study also found no significant difference in spelling ability for words in isolation between print and braille users. Clarke and Stoner's 2008 study shed useful light on the issue of spelling and contracted/uncontracted braille. Of the 23 students studied, the 5 students who used uncontracted braille had 'spelling assessments that were comparable to those of the 18 students who used contracted braille' (p559).

In a finding from the ABC project that is described as 'surprising', Emerson, Holbrook and D'Andrea (2009, p618) note that spelling was a strength for the children in the study, regardless of whether they used contractions or not and 84% of the children in the study were 'at or above grade [age] level' in spelling' (p617). While children who had been introduced to higher number of contractions tended to do better in spelling than the children who had been introduced to fewer contractions, the group with fewer contractions were not necessarily poor spellers, but the 'top spellers' were all students who had learned 'many' contractions. While the findings support the view that contractions do not hinder the development of good spelling skills, the confounding difficulties of the sampling discussed above do not allow for conclusions to be drawn about the relative effects of learning through contracted and uncontracted braille on spelling performance. For example, the good spelling performance of the 'high contraction' group may be linked to the fact that when young braille readers are taught through contracted braille 'emphasis is usually placed on teaching the letters of which contractions are composed' (Millar 1997, p182), i.e. there is an element of uncontracted braille in every child's learning.

5.6 Summary

There are conflicting views about whether introducing children to reading through contracted or uncontracted braille produces better long term results. Much of the evidence to suggest that the use of uncontracted braille for initial literacy instruction improves reading fluency, vocabulary, spelling and comprehension (e.g. Mangold 2000, Miller and Rash 2001) seems largely anecdotal. Indeed, the recent ABC project in the US and Canada, while noting that while there was only a positive 'minor link' between the number of contractions a child is exposed to and general reading level, still concluded 'all things being equal' early introduction of contractions is associated with higher later literacy performance.

Although there are arguments for both the early and late introduction of contractions, sufficient empirical research does not yet exist to resolve the debate conclusively. It seems there is only general agreement that instruction needs to focus on reading processes, regardless of how or when contractions are introduced.

The findings of the ABC study certainly seem to counter the criticisms of some supporters of uncontracted braille that contractions have an adverse effect on reading fluency, spelling or efficiency of hand movements during reading. There is no evidence that uncontracted braille has significant benefits for reducing scrubbing, regressions or pauses in braille readers. Further, the use of contractions does not seem to impinge on fluency in oral reading and there is no firm evidence that children who use contracted braille are likely to be poorer spellers than children who use uncontracted braille. Indeed, if anything the evidence points in the other direction.

While the level of achievement in acquiring literacy skills was found to be strongly correlated with the frequency and quality of students' interactions with their peers who are sighted, no empirical evidence is yet available to support the view that use of uncontracted braille in mainstream classrooms increases the quality or quantity of social experiences in literacy activities for children who are blind.

In short, proof one way or another is elusive, and empirical studies of the outcomes of children's reading or writing performance in this area are difficult because of the number of confounding variables. In the absence of conclusive research findings, it appears that relative advantages of contracted or uncontracted braille must be judged on other factors that fall beyond children's reading performance. For example, uncontracted braille may have some advantages for the management of literacy teaching in mainstream classrooms (e.g. unification of reading materials for sighted and non-sighted pupils, alignment of phonic instruction). In contrast, teaching contracted braille may have some advantages because of the existing availability of contracted braille resources, particularly for older students (e.g. text books, assessment materials).

As was argued by a practitioner who commented on an earlier draft of this literature review, in the early stages of learning to read and write Braille, both contracted and uncontracted approaches have much commonality. In both methods there is often a focus upon letters of the alphabet and their phonic values, so consequently it may still be possible

for teachers to “hedge their bets” between uncontracted and contracted braille in the early stages according to individual need. It is certainly the case that in the writing of children who use contractions from the start, a ‘hybrid form’ of part-contracted writing is acceptable and inevitable, since it would not be appropriate to limit children to writing only the words that contain the contractions they already know. As was stated above, even children using contracted braille are commonly introduced to words in their contracted and uncontracted form simultaneously for the purpose of developing spelling skills.

However, it is early success that provides the motivation to read braille. Therefore regardless of whether uncontracted or contracted braille is the preferred medium for initial instruction, consideration should still be given to the order in which specific braille symbols are introduced to reduce the potential for confusion of reversals, inversions etc. Further, attention should still be paid to the symbols which will be more easily recognised in the early stages of learning braille.

If the child is introduced to literacy through uncontracted braille then the transition to the contracted code needs careful management. There is currently no advice for teachers about when and how this transition is best managed, and how it can be effectively monitored. The feedback from the practitioners who reviewed the draft of this report was that for most children, the transition should be completed before the end of Key Stage 2. There was also a strong view that the decision about which approach to take should be based on the assessed needs of the child, rather than the perceived advantages for the professionals around the child.

6 Question 3: Technology for braille users

This section presents literature which seeks to address the research question '*What is the relationship between advances in technology and the development of learning through braille*.' This question addresses the issue of whether advances in technology make the development of literacy through braille less important, what role technology can play in the development of literacy, and what skills and equipment are needed by children who use braille.

6.1 Introduction and context

The question of whether advances in digital technology have reduced the relevance of braille has been a recent topic of debate in relation to adults. For example, in the USA, controversy surrounded the publication in the New York Times Magazine in December 2009 of an article about a successful blind business executive who questioned the continuing relevance of braille in the new information age describing braille as 'an arcane means of communication, which for the most part should be abolished' (Aviv, 2009). The article prompted a robust defence of braille in publications such as the AFB's Braille Monitor. In the UK, a recent RNIB-funded research project investigating braille teaching to adults with acquired sight loss (Douglas et al, 2009) identified a perception by some rehabilitation workers and blind people of a tension, or indeed even the need to make a *choice,* between teaching or learning braille and teaching or learning technology skills. This debate in relation to children's education appears to be more subtle and emerging. Indeed, we have found little empirical literature which investigates this topic, although a number of authors have raised concerns and/or formulated positions.

A useful starting point is to consider that until relatively recently (approximately the early 1990s in the UK) children with visual impairment would have used either print *or* hard copy braille as their 'primary' route to literacy. The term 'dual media user' was applied to the relatively small proportion of children who used both print and hard copy braille. Arguably however, the fact that digital information can now be accessed in a variety of formats, including enlarged print, braille and audio, potentially makes all children 'multi-media users'. In short, the emergence of technology as a route for many children to access literacy has 'blurred' the traditional boundary that stood between hard copy

braille and hard copy print and as a consequence, views of what might constitute appropriate 'routes to literacy' for some children might need to change. In this section we explore this emerging area.

In their comprehensive book on Assistive Technology for students who are visually impaired Presley and D'Andrea (2008) consider the impact of developments in technology and its impact on access to information for learners who are blind in mainstream classrooms. They point to the rapid changes in a society where now much of the information is digital in origin and has not been converted from print, but is created, shared and accessed in electronic form. Print books and printed materials are no longer the only text based materials used in schools, text used by children can appear on bulletin board displays, whiteboards, computer screens, mobile phone displays. Similarly, Ebooks, internet sources, and emails all carry information into the classroom. For all children in mainstream schools, proficiency in the use of personal computers and their applications, including word processing, accessing databases, search engines and email is obviously a key skill. The ability to access electronic information in the home is increasingly becoming a requirement for successful educational and social development. For children who are sighted or who have low vision, this electronic information is primarily accessed through visual and/or auditory means; for children who are blind it is primarily accessed through touch and/or auditory means.

6.2 Braille and technology

The question of whether the huge increase of information in digital form that can be manipulated into speech means that blind children are now less reliant on braille is a controversial one. Presley and D'Andrea (2008, p337) acknowledge that accessing print information through auditory means often initiates concerns among specialist teachers of pupils with visual impairment about 'giving up' on the students' use of braille. They go on to argue that speech access should be regarded as a useful tool to support learning '*once literacy skills are firmly established'* (p337) and note the limitations of speech as a primary learning medium. As an example, they point out that use of compressed (speeded) electronic speech may be useful for reading a chapter in a history textbook, but is unlikely to be of similar value when reading a maths textbook. However, the authors of this report believe that although computer-based speech access *alone* would not be an appropriate or satisfactory route to literacy for any child, the position that children who

are blind should have limited access to digital technology until braille literacy is established is unrealistic.

While screen reading software with speech output (e.g. Jaws) is in common use in schools and colleges, a technical solution which allows for accessing digital information through braille rather than speech is also available in the form of refreshable braille displays (electro-mechanical devices for displaying braille characters). Presley and D'Andrea (2008 p103) argue that providing braille readers with access to electronic text through the use of a refreshable braille display can, 'even at a young age ... increase their library from just a few books to hundreds'. Refreshable braille is available in a range of forms. It can be accessed through peripheral hardware devices that can be connected to standard computers to allow users to read by touch what appears on the computer screen. These devices contain displays commonly made up of a single row of 40 or 80 refreshable cells, and typically have in built navigation devices to allow readers to negotiate large amounts of text usually in either contracted or uncontracted braille . These freestanding displays remain relatively expensive and although precise figures are not available, they are thought to be still relatively uncommon in UK schools. However braille notetakers (portable braille computers) with inbuilt refreshable braille displays are in more common use. The braille displays on notetaker devices are normally shorter (18-30 cells), but the notetakers often allow for the option of speech or braille outputs.

Obviously literacy is not just made up of access to text (reading), but also involves *writing,* and here the choice for children who are blind essentially rests between devices with braille or QWERTY keyboards. Notetakers, for example, may have braille *or* QWERTY keyboards and there are clear advantages for children to have mastery of both input options. Therefore a relevant question is '*when* should children who use braille be taught QWERTY keyboard skills?' According to Presley and D'Andrea, as a broad rule of thumb, indications about when to introduce specific technology skills can best be determined by looking at the tasks sighted classmates are doing (although they do see advantages in the proactive teaching of technology skills to anticipate future needs). They reflect the commonly held view that children with visual impairment need to be able to use a combination of technological tools to accomplish literacy tasks in both printed and electronic form. They describe a 'technology continuum' that begins with low tech tools, moving to increasingly higher tech tools as children's skills increase with age e.g. moving from a mechanical or semi mechanical writing machine that produces hard copy to a portable braille notebook with a refreshable

braille display. Other researchers and commentators have taken a different, arguably less conservative, approach advocating early exposure to technology to support the development of literacy.

In an investigation of the use of technology in early literacy teaching, Murphy, Hatton and Erickson (2008) carried out a survey of specialist visiting teachers of pupils with visual impairment who work with preschool children in the USA. They found that most preschool children with visual impairment were not given access to assistive technology devices that may potentially facilitate literacy development, with only 3% always, or almost always, providing access to electronic text from the internet e.g. digital books, 15% providing regular access to screen reading software, and 20% to CCTVs on a regular basis.

Kelly and Smith (2008) found that young people with visual impairment used computers and telephones for social purposes not only less often than sighted children but also less often than some other disability groups. They identified the use of assistive technology devices and software to access digital social networking forums as a 'component of the specialised Expanded Core Curriculum that is taught to students who are visually impaired'. (p538)

Kelly (2009) analysed data collected between 2001-4 that suggested between 59% and 71% of the students with visual impairments in the USA who were most inclined to benefit from assistive technology did not have the opportunity to use it. They argued that access to information and social networking web sites through mobile devices via adaptive hardware and software is vital if children and young people who are visually impaired are to connect fully with others academically, professionally, and socially. Kelly recommended that immediate attention should be given to this area which has the potential to re-orient the education of students who are visually impaired.

Zhou, Parker, Smith and Griffen-Shirley (2011) in another American study of the use of assistive technology for students with visual impairments reported that a major barrier hindering the use of technology in school was the lack of skills and knowledge by teachers of pupils with visual impairment. In an attempt to understand the specific deficits in knowledge and skills of qualified teachers of pupils with visual impairment, they asked 165 teachers in Texas to compare the levels of expertise they perceived they possessed against the levels of expertise they perceived they were expected to possess across 74 competencies

for teachers of pupils with visual impairment related to Assistive technology defined by Smith et al. (2009). The survey revealed a self assessed deficit in 55 of the 74 competencies. They also found that only 41% of the teachers surveyed felt confident or very confident that they could teach most or all forms of assistive technology. Among the competencies where teachers felt they were lacking were: assistive devices relating to braille literacy and its application, use of screen reading software, use of braille translation software, refreshable braille displays and related software, electronic braille devices, and sourcing funds for technology devices. They concluded that training in this area needed strengthening through increased emphasis on the topic in specialist teacher preparation programmes and through better in-service training for qualified teachers of pupils with visual impairment. Given the pace of change in the area however they believed that the development of 'assistive technology specialists' as 'new types of professional in the field of visual impairment will ultimately be necessary'. (p208)

Kelly and Smith (2011) analysed research into the impact of assistive technology on the educational performance of children with visual impairments. They make the point that assistive technology tends to be developed faster than researchers can evaluate it, so evaluating its effectiveness on educational performance is very difficult. While acknowledging that there was a wide knowledge base relating to technology in the field of education and visual impairment, they concluded that 'the extent to which the field has researched the effectiveness of assistive technology used by students who are visually impaired using rigorous, scientific-based methods is close to non-existent.'(p79). The only article that met their rigorous search criteria was an early study by Koenig and Ashcroft (1983) that found no significant difference between the use of a mechanical and an electrical version of a Perkins brailler on writing rates and accuracy.

Kelly (2011) provided the results of a secondary analysis of data from a national longitudinal study that included the views of parents of children with a visual impairment. Children whose parents were confident that their children would get a paid job were 1.5 times more likely to use assistive technology, and children of parents who took an active part in parent meetings or parent training sessions were 1.4 times more likely to use assistive technology. In addition to the importance of parental involvement and expectations as predictors for technology use she found that placement was also a salient factor in determining likelihood of the use of technology. She found that high school students with visual impairment who attended residential schools were 1.8 times more likely

to use assistive technology devices than those who did not attend such schools.

Given the range of options and the lack of clear evidence about the relative educational effectiveness of devices, decisions about the type of technology the child needs, e.g. whether to use an accessible conventional laptop or a dedicated braille computer (Braille Personal Digital Assistant PDA), are often difficult ones to make. Nevertheless Presley and D'Andrea (2008) argue that a comprehensive assistive technology assessment forms a 'critical part of the education' for each child with a visual impairment, and should follow on naturally from a clinical low vision evaluation, a functional vision assessment and a learning media assessment. They see these assessments as essential to determine which sense the student can most effectively utilise to obtain information from the environment. They provide (very) detailed proformas in their book for such assessments.

A related issue to the development of technology is the move to create a single braille code which could be applied across all subject areas (except music) and all English speaking countries. The Unified English Braille (UEB) code would make it easier for computer software to translate contracted braille to print and print to braille. It is designed to allow for the more precise capture in braille of the subtleties of print presentation.

With increased exposure to digital information derived directly from print, children who are blind need increasingly to be aware of print conventions and layout when accessing or communicating information through screen readers or QWERTY keyboards, and UEB has the potential to improve this awareness. UEB has already been adopted as the standard code by countries such as Australia and there is a move to recognise it as the standard code in the UK. Further discussion of the implications of this issue can be found in Section 10.1 below.

6.3 Summary

The empirical literature in relation to the interaction between digital technology and the teaching of literacy through braille appears to be underdeveloped. However there is no evidence in the research literature to support the view that technology has an adverse effect on the development of literacy through braille. It is also difficult to find hard evidence for the argument that developments in technology make it

more likely that teachers will sustain instruction through print to the detriment of braille instruction (see also the section of this report on dual media use).

There is surprisingly little research into the potential of digital technology to support the teaching of early literacy through braille. Research does however suggest that digital technology can play a key role in supporting the consolidation of braille literacy skills through developments such as refreshable braille, and has the potential to provide children with hugely increased access to braille text in both digital and hard copy formats. In relation to the timing of the introduction of the introduction of technology that uses speech rather than braille to access text, there appears to be a disagreement between commentators as to the best pedagogical approach to take: some argue caution, believing that early introduction to speech technology may undermine braille literacy development; while others focus upon the importance of the teaching of ICT skills as early as possible. Further reflection and research is needed in relation to this emerging issue so that clear guidance can be offered to teachers.

The authors of this report believe that advances in digital technology should not be seen as a threat to braille, the threat comes from children not having sufficient access to the technology that can enhance and encourage learning through braille. It is essential that children who are blind should have access to technology that will allow flexible access through both touch and hearing to the wave of digital information that is entering the classroom and helping to shape all children's educational development and social communication. Digital technology has huge potential for opening up access to learning materials in braille and for facilitating more flexible access through braille to key areas such as national examinations.

Evidence in the USA suggests that key barriers to the role that digital technology can play in the development and consolidation of literacy skills through braille are:

- the *under*-use of technology that has the potential to support the development of literacy skills by children who use braille;
- the lack of confidence that some specialist teachers possess in their own braille technology knowledge and skill;
- lack of understanding in some parents of children who are blind about how to support the development of their children's technological awareness.

The technology skills that blind children need to develop literacy require regular and ongoing assessment. These skills have been defined in the literature, as have the skills and understanding that teachers need to support them. While there is little research evidence about the relative educational effectiveness of the wide range of devices available, there is strong support for the belief that children who use braille need to develop a range of technological skills that will allow them to choose the solution that best meets the demands of the literacy task, be it related to reading or writing.

7 Question 4: Assessment and choosing media

7.1 Research question

This section presents literature which seeks to address the research question: '*What are the key criteria for deciding braille is (or is not) an appropriate route for literacy for a child or young person*?'

Decisions about which format to use to develop and maintain literacy skills for children who have severe visual impairment are inherently difficult and are affected by a number of considerations, for example the degree of vision loss, prognosis, efficiency of vision use, and parental preference (Corn and Koenig 2002). Koenig (1996, 1998) provide detailed guidelines for practitioners on selecting appropriate reading media for children with severe low vision. The Learning Media Assessment (LMA) procedure was developed by Koenig and Holbrook (1995) to help teachers assess whether children should receive literacy instruction through braille, print or through a combination of braille and print (dual media). The authors stressed that the outcome of the LMA should not be seen as a 'once and for all decision' and recommended that children be regularly assessed to determine the continued appropriateness of the child's literacy medium. Although the LMA is not commonly used in the UK, there have been recent moves to consider updating and adapting the assessment for UK use.

7.2 Assessment of reading

There is little argument that the accurate assessment of literacy performance is important for informing literacy teaching: assessment gives teachers an insight into pupils' progress and the particular difficulties they may be facing. This is as true for the teaching of literacy through braille as it is for teaching literacy through print. Such assessment tools can also be used to inform decisions about appropriate literacy media for children with visual impairment. Greaney et al (1998) and Douglas et al (2002) reported on adaptations made to the Neale Analysis of Reading Ability (NARA), a reading test developed for fully sighted children aged 6-13 that tests reading speed, accuracy, and comprehension. The authors aimed to generate norm scores for braille and low vision print readers respectively.

Douglas et al (2002) tested the reading of 476 children with low vision using an unmodified print version of the NARA. The data showed that the average reading ages (based upon sighted norms) for accuracy, comprehension and speed for children with low vision fall below their chronological age. For a fuller analysis of the results also see Hill et al (2005).

Greaney et al (1998) tested the reading of 317 braille readers (in the UK and Ireland) using a braille version of the NARA. The data showed that the average reading ages for accuracy, comprehension and speed for the sample were not only below those of their fully sighted peers but perhaps importantly, they were below the reading ages of the low vision readers in Douglas et al's sample. The size of the reading 'lag' between children with visual impairment who use print or braille and fully sighted children increases with age. In the case of children who used braille, however, the lag increases most in their speed of reading. Whereas in relation to comprehension, Greaney et al. (1994, p55) quote Tobin (1994) who found that 'often … visually impaired pupils' comprehension scores are on a par with their chronological ages, even though their speed and accuracy scores are well below that of their fully sighted peers.'

In the UK the NARA remains the only widely used standardised braille assessment procedure, although the Lorimer Braille Recognition Test - A Test of Ability in Reading Braille Contractions (CTB 1962) and the Tooze Braille Speed Test (CTB 1962) are still used in some services. All of these procedures are currently out of print (including the relatively recently developed braille version of the NARA, which is in the process of being re-printed and will be available again from RNIB).

In the USA, the assessment of braille literacy skills is commonly based upon reading measures developed for children who are fully sighted. For example the ABC project adopted annual literacy assessments that included the Texas Primary Reading Inventory (TPRI, 2003), the Johns Basic Reading Inventory (Johns 2003), the Brigance Comprehensive Inventory of Basic Skills (BRI, Brigance 1999) since these 'are commonly used in elementary classrooms [..] and are readily available in braille.' (Emerson, Holbrook and D'Andrea 2009 p613).

When the results of the reading levels on the results of the BRI were analysed in the ABC project, 'consistently poor performance' was found across the year levels. It was found that while assessments in

kindergarten (reception classes) and Grade 1 (Year 1) classes showed that children who were blind had acquired the basic mechanics of reading such as phonemic awareness and decoding skills, less than half of the children were able to maintain an age appropriate performance across the 5 Years of the study. However it should be stressed that the because the ABC used transcriptions of sighted reading tests to assess braille reading performance, the comparisons were made in relation to the expected reading performance of fully sighted print readers.

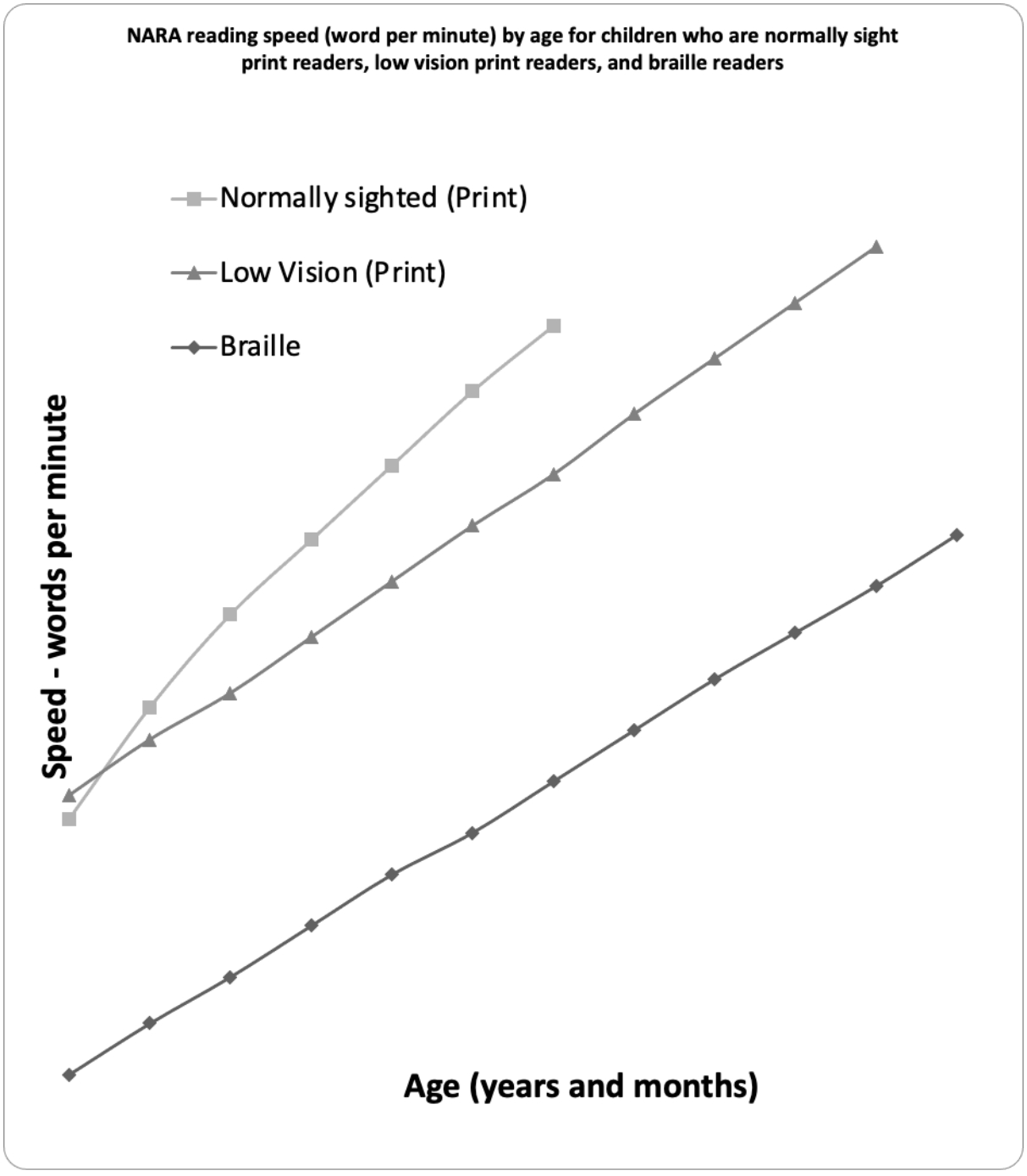
Clearly a key decision in future debates about the assessment of literacy is whether tools that are developed for the assessment of braille reading should be designed to afford comparisons with the reading performance of children who are fully sighted or with the performance of other braille readers. Another consideration is whether they should be compatible with contracted or uncontracted use, or both. The braille version of the NARA appears to be unique in that it has been standardised for braille readers *and* print readers. This enables the user to make meaningful comparisons with sighted children (e.g. comparisons in relation to expected reading speeds for children of a given age). Perhaps more importantly, it enables comparisons across *braille* readers – e.g. it gives a sense of what might be expected as a reading speed for a braille reader of a given age. This is important when carrying out a meaningful diagnostic analysis of a child's reading.

7.3 Reading speed and reading media choice

Speed of reading has become a particular focus for attention in the debate about the choice of reading media. Lusk and Corn (2006) acknowledge that while reading speed should not be the only criterion, it is important for children to develop a 'functional and competitive reading speed in either print or braille' (p655). Given the increased inclusion of children with visual impairment in mainstream schools it is perhaps inevitable that increasing comparisons will be made with the reading performance with children who are fully sighted. Wolffe (2000) asserts that for any job in which literacy is used, a minimum silent reading rate of 150 words per minute (wpm) should be expected. Lowenfeld, Able and Hatlen (1969) had found that 149 wpm was a typical silent reading rate for braille readers in lower secondary classes of mainstream schools. After reviewing a range of studies on reading speeds, Koenig (1996) suggested that if a child was not expected to achieve a silent reading speed of 100-125 wpm through print, a teacher may need to consider braille as an alternative medium. Koenig suggested that by plotting a

child's reading rates over the first 3-4 years of schooling, it was possible to predict reading rates at secondary school level.

The following graph shows the average oral reading speeds for different types of readers using the NARA (braille readers, low vision print readers and normally sighted print readers). Data is taken from the NARA standardised reading score for sighted children (Neale, 1997), Greaney et al (1998) and Douglas et al (2002).



The graph gives some indication of the oral reading speed which might be expected from braille readers at given school ages. Children with low vision might be expected to read more quickly and if severity of sight loss appears to be responsible for reading speeds slower than braille reading speeds then this will provide some evidence that braille may be a more suitable reading media.

It should be taken into account that the reading speeds derived for the low vision readers by Douglas et al did not include optimised print presentation (with enlarged print or LVAs).

7.4 'Dual Media' (braille and print) Use

Children who learn to read through print and then transfer to braille require teaching approaches that are different from those required for children learning to read initially through braille. For children who are print users and who experience deteriorating vision, the question often becomes one of "when and how" rather than "whether" to introduce braille, and the decision can be a "profoundly emotional" one (e.g. Wormsley and D'Andrea 1997).

A relatively small proportion of children will require access to both braille and print: most will focus on one medium. A UK study by Rogers (2007) found that only 107 children used both print and braille for reading or writing (approximately 17% of the population of children aged between five and sixteen who used braille). Rogers suggested that because teachers often see visual processing as faster and more efficient than tactual processing, print initially may be seen as the preferred format for children with very low vision, particularly in reception and early primary classes, where children are not required to process large amounts of information. Almost all the children (86%) in her sample had begun by learning print in reception class, but by the age of seven 54% had also been introduced to braille. The study found that dual media users did not use braille and print in equal amounts and identified three groups: predominantly print users, predominantly braille users, and children who appeared to use both print and braille successfully. Some children who were predominantly braille users preferred to use print for curriculum areas where there were relatively small amounts of text to process (for example maths).

In the same study, teachers saw parents' attitudes as being a significant element in the degree to which children who used print accepted braille. It was reported that positive attitudes to braille among parents, class

teachers and learning assistants were essential if braille was to be introduced successfully. The study also reported that although decisions about dual braille and print use were usually taken individually, some UK authorities actively discouraged simultaneous instruction in print and braille and applied a policy that children should learn through one medium or the other.

Lusk and Corn (2006a) note that a single-medium policy was common in the United States in the 1970s but that dual use was now seen as a positive advantage for some children. They studied dual-media learners in the United States and explored the instructional methods and curricular decisions of teaching dual media to students with low vision reporting the students' present literacy levels and reading rates and their teachers' expectations for future levels of literacy. The study found a generally positive attitude towards both print and braille among the students.

Half the students who used dual media in Lusk and Corn's study had progressively deteriorating eye conditions and only 15% used standard print with optical devices as their primary reading medium. In addition, 49% used large print, 19% used braille, and 18% used standard print without optical devices as their primary reading medium. In keeping with the Rogers study, Lusk and Corn found that the majority of children had been introduced to braille by the age of seven. The study also found that the most common factor in teachers' decision to introduce dual media instruction was concern by teachers and parents about the progressive nature of the child's eye condition, followed by concerns about print reading stamina and speed. Concerns about braille reading stamina and speed accounted for only a small proportion of decisions. In a small number of cases (6 teachers and 4 parents) decisions were based upon a philosophical belief that all students with visual impairment should learn braille. Concerns expressed by students themselves included worries about print stamina (n=27) and print reading speed (n=20). Most parents were reported by teachers as being very supportive of a dual media approach to literacy with only 6% of parents reported as unsupportive.

The instructional approaches to braille reading adopted by teachers using dual media use of reading were almost evenly split between introduction through contracted braille and uncontracted braille, with a slight preference for contracted braille (Lusk and Corn 2006b). While most children used enlarged print, just over half of the students used CCTV (closed circuit television) magnifiers and just under a third used

optical low vision devices to access standard print. With regard to print reading, 26 of the 76 students were reading below their grade level and 14 were two or more years below their grade level. With regard to braille, 36 of the 63 students for whom data was available were reading below their grade level, with 25 more than 2 years below their grade level. However, only 15 students were found to be reading below their grade level in both print and braille. The instructional time available for print reading was reported as far exceeding the instructional time available for braille (Lusk and Corn 2008b).

7.5 Media choices for children with additional needs

Parker and Pogrund (2009) reported 'minimal' research into the literacy of students with a visual impairments and additional disabilities, and the review found only 9 literacy studies that included such students, even though they make up 'approximately 65%' (p635) of the population of children with visual impairments.

Koenig (1992) proposed a model of braille literacy for children with visual impairments who do not have additional disabilities, that included 'preliteracy', 'emergent literacy' and 'early literacy'. The appropriateness of this model for learners with additional disabilities has been challenged by a number of authors (e.g. McCall and McLinden 1997, 2001). They argue for the acceptance of wider range of behaviours than those specified by Koenig as examples of early literacy behaviours, such as the use Objects of Reference and tactile symbols to develop one-to-one correspondence between symbols and objects. McLinden and McCall (2002) presented an overview of the range of options for interpersonal communication through touch, including tactile sign systems, and concluded that opportunities for the development of functional literacy should be afforded to all children with visual impairment and that reading and writing fluently through braille or print should be seen as the apex of a continuum of authentic literacy behaviours for children who are visually impaired and have additional disabilities.

Durando (2008) found that 45% of American teachers of the visually impaired thought that braille was too difficult for their students who had multiple disabilities, and teachers rated cognitive ability as the highest factor for determining whether the children would be instructed in literacy. Durando and Wormsley (2009) recommended a detailed functional approach to the teaching of literacy through braille for children with complex needs. The 'individualised meaning centred approach' involves the development of braille rich environments, individualised

reading materials and focuses initially on establishing a small vocabulary of words that are relevant to the individual using a whole word method, followed by the introduction of phonological skills. The functional approach 'begins with determining whether braille will be the literacy medium for the students and whether to use uncontracted ... or contracted braille' (p150).

McCall and McLinden (1997, 2001) reported on the use of the Moon code by teachers in the UK as an alternative medium to provide a route to literacy for learners with complex needs. They provide examples of how Moon can be linked to Objects of Reference and to promote activities such as choice making, and functional expressive and receptive communication, including labelling and the reading of simple phonic based texts. In a survey of Moon use in the UK, McCall and McLinden (1997) found that most children who used Moon could not read it independently and that children were not reading Moon in the conventional sense but using it as an aid to simple choice-making, for the labelling of objects, or as a stepping-stone for moving from communication systems such as objects of reference to a more formal medium of literacy.

There is only anecdotal evidence of children using Moon as a stepping stone to braille, (e.g. Squire 2009), and McCall and McLinden (2001) reported that most children who used Moon would be unlikely to progress to fluent formal reading and writing. Among the advantages they claimed for Moon is that the line based nature of the code offers opportunities for enlarging letters, and that Moon requires less sophisticated touch discrimination skills than braille. Among its disadvantages, they identified the code design (e.g. many letters are reversals or inversions of other letters) and the lack of a satisfactory Moon writing device.

Parker and Pogrund's review of the literature (2009) concluded that research studies into the literacy of children who have visual impairments and additional disabilities do not offer findings that can be generalised. However they found broad agreement related to three recurring themes relating to recognition of children's literacy achievements; individual tailoring of media for access and participation; persistence and collaboration.

Parker and Pogrund found that the literature suggests that it is essential that the literacy learning environment needs to be responsive to students' initial literacy behaviours. Teachers and parents need to

encourage children's initial literacy behaviours, such as hand movements to explore media (Erickson, Hatton, Roy, Fox, and Renne, 2007) and acknowledge them as valid demonstrations of literacy. Teachers also need to have a clear understanding how to identify, select and tailor learning media to the needs of the child. This range of learning media may embrace visual approaches such as the use of pictorial representation or approaches based on the use of touch or combinations of touch and vision, and an understanding of the technological aids and devices available. Approaches that involved the child, family and educational professionals working together to provide consistent instruction that perseveres over time were also seen as essential. Persistence in areas such as motor control for reading, and perseverance in learning braille were identified as common requirements.

The studies also suggest the importance of rejecting the 'myth of reading readiness' (Parker and Pogrund, 2009, p643) that suggests that literacy related teaching should not be commenced until the child is deemed ready for it, literacy development is a process that begins at birth and continues through a lifetime.

7.6 Summary

The accurate assessment of literacy performance is important for informing literacy teaching. The braille version of the NARA (Greaney et al 1998) offers a powerful standardised assessment of (contracted) braille reading performance. It is particularly useful because it enables the user to make meaningful comparisons with sighted children (e.g. comparisons in relation to expected print reading speeds for children of a given age), and enables comparisons across *braille* readers which allows meaningful diagnostic analysis of a child's reading. Importantly this assessment is currently out of print (and the current version is based upon contracted braille). The current version is however, in the process of being re-printed and will be available again from RNIB.

Deciding whether braille is an appropriate route to literacy is complex and involves many issues. Nevertheless, some reading-performance based criteria which inform decisions would be helpful. Embedding this within a re-developed 'Learning Media Assessment' would be a useful step forward.

Learning to read through braille and print in combination appears to be a legitimate, successful and sensitive route to literacy for some children and young people.

The choice of reading media for children with additional learning difficulties presents particular challenges. Further research is needed in this area but the notion of a ‘functional approach’ to literacy for some children and young people may be appropriate (which differs from traditional developmental models of literacy through braille).

8 Braille reading schemes

One strand of the research brief was to conduct a survey of the use of braille reading schemes in current use throughout the UK, and to find out broadly how they were used and what teachers thought of them. Thirty one participants took part in the survey. Most (28) participants described their professional roles as specialist teacher of children with visual impairment, and the remaining three described themselves as: an 'Inclusion Consultant for visual impairment', a 'class teacher in a special needs school with two braillists in my class (Year 4)', and a 'braille tutor'. The majority reported that they had completed a mandatory qualification for teachers of children with visual impairment (or equivalent) (26) or were undertaking training (3). The survey sought to collect opinions from a wide range of practitioners rather than from a narrow group of 'expert' witnesses.

In the following sections we summarise responses in relation to each of the reading schemes. Unless described otherwise, presented quotes are taken verbatim from the questionnaire responses (which were sometimes given in note form).

8.1 Feeling Ready to Read

Based on Snow White and Seven Dwarfs, this scheme is designed to teach 'pre-braille' skills. The scheme includes:

- a guide for parents and teachers;
- swell paper exercises to practise skills such as accurate tracking of lines, tactile discrimination, two-handed coordination and developing a light finger touch;
- a simple version of the story with tactile illustrations for the children to "read" for themselves.

Thirteen respondents provided information on the perceived 'strengths' and 'weaknesses' of this scheme.

Reported Strengths

Three respondents made reference to the progression/gradation between the tasks as being particular strengths of the scheme. As an

example one respondent described the scheme as including '*a wide variety of tasks with good gradation between them'* with another noting the *'progressive exercises for each skill*'. Three respondents made reference to the variety of materials and/or tasks included in the scheme. The versatility of the scheme was praised by others:

- *'The many different activity books that could be used flexibly and revisited in different ways'*
- '*Additional (similar) materials can be made relatively easily.*'

The '*simple tactile graphics*' of the scheme were also highlighted by one respondent.

A number of respondents made reference to the development of touch/tactile discrimination and pre-braille skills (e.g. *'good for feeling',* '*useful to introduce some elements of tactile discrimination*', '*emphasis on the pre-braille skills makes it unique*'). One respondent noted that the scheme '*encourages systematic development of the tactile sense through gradually increased exposure to braille'* with the scheme:

- *Encouraging and motivating young pupils to develop the tactile sense via a recognizable and familiar story which generates much discussion and allows creative development within the mind of young children*

Reported weaknesses

The majority of reported 'weaknesses' were concerned with the relevance of the scheme for particular groups of children. As an example, two respondents reported that the subject matter of one story in the scheme (Snow White) had greater relevance to girls. Two respondents made reference to the age appropriateness of the scheme with one respondent noting that the scheme was *'only really suitable for young children'* and another reporting it was not appropriate when working with an older primary school child. There was a range of negative views related to the story content – e.g. '*a bit scary for some*', *'a little dull'*, '*children learn it by heart', '[story in the] booklet is too complex*'.

Of particular interest given the strengths reported above was the comment by one respondent that the scheme requires *'quite high order touch skills.'* Other reported weaknesses related to the physical design of the scheme with one respondent noting that some of the raised lines start to peel away with use.

Summary

Feeling Ready to Read appears to have particular strengths for pre-braille activities which aim to develop a child's tactual skills ('*Wonderful resource for busy teachers', 'very useful and there is little [else] available at this level'*). Many respondents felt the scheme was quite limited beyond these pre-braille and early-braille stages.

8.2 Braille for Infants

This scheme is designed for the 'young' child. It was written as a phonetic reading scheme by the Infant Level Working Party of the Association for the Education and Welfare of the Visually Handicapped (AEWVH, now VIEW). The scheme includes 27 individual books and teachers guide that introduce the alphabet and a number of simple wordsigns, shortforms and punctuation marks. As reported on the RNIB website, this scheme will be replaced by the 'Hands On' reading scheme in 2011.

Twenty-one respondents provided information on the perceived 'strengths' and 'weaknesses' of this scheme.

Reported Strengths

Many of the strengths reported by respondents related explicitly to the design of the scheme (i.e. the structured order of introduction to the braille code). As illustrated through the following quotes, the repetition and predictability of the scheme were identified as particular strengths:

- *Logical introduction of letters/ words.*
- *Good format of similar pages in each book.*
- *Repetition of all words good.*
- *Simple and well structured, predictable which is good for confidence building.*
- *Very structured and lots of repetition.*
- *I feel for less experienced teachers it is a 'fail safe' option.*

In commenting on the progressive order of introduction from letters through to more complex contractions, one respondent noted that it:

- *[..] exposes the children systematically and provides reinforcement chances to consolidate the knowledge of each braille letter [..] It even carefully orders the braille in a way to ease children into developing awareness of easy to read braille letters initially and culminating in enabling them to read the more complex braille letters and cells.*

A number of respondents made reference to the physical design features of the scheme (i.e. as a scheme particularly designed for young children). As an example, one respondent noted the '*manageable size of book*' used in the scheme with another reporting as a strength the '*amount of braille*' on each page. Two respondents made reference to the ease with which additional resources could be drawn upon to supplement the scheme:

- *[..] able to make up for lack of pictures/tactile with use of tangible objects e.g. variety of balls, eggs and a handbag!*
- *Simple - we have lots of resources to use with it and each year managed to add to these*

The pedagogical approach was cited by a number of respondents. As an example one respondent made reference to the scheme as an '*excellent introduction regarding tactile and phonic work*' with another noting that the scheme '*Teaches signs well, introduces [contracted] braille from the start*'. Another respondent reported that the scheme was:

- *[..] a great way to teach the braille code. I would go as far as to say it is the best method of teaching braille to young children in my experience.*

One respondent identified the design of the scheme as being a particular strength in relation to the diversity of need within the population of children with visual impairment:

- *Simple, easy to teach, slow enough for those with SEN as well as VI, [the more able children] fly through it.*

In referring to the use of the scheme alongside other approaches one respondent reported that it allows:

- *Progression of introduction of signs which can be taught alongside the letter sounds introduced in class.*

Reported weaknesses

Whereas the strengths of the scheme were viewed by many respondents as being the predictability and repetitive nature of the content, these same features appeared also to be perceived weaknesses. As an example, many respondents described the scheme as being boring, e.g. '*Depressingly mundane like all initial reading schemes*', '*Very boring!! For both teacher and child*'. This was highlighted by some respondents as being a particular problem for older children (seven years upwards). There was some criticism of the scheme's supplementary audio materials e.g.:

- *[..] so much of the interest in print books comes from the illustrations & BFI have none. I used to use the tape that went with it. The songs were good, but the reading voice was boring.'*

There was however a feeling that the perceived dullness of the content could be compensated for by the development of supplementary resources:

- *It is quite boring in story content but this can be easily overcome by making tailor made braille resources to supplement the scheme such as braille games: noughts and crosses- using learned braille letters and signs, word families- likewise, braille bingo, magnetic fish game all displaying braille the children are currently working on*

In relation to contractions, one participant noted that the scheme '*jumps straight into intro short forms which can be confusing*'. This was highlighted further by a respondent who (inevitably) questioned the appropriacy of the scheme to children learning uncontracted braille:

- *All of our pupils learn [uncontracted] braille initially and so this is not a great intro to braille literacy.*

Further, one respondent reported that s/he had decided to abandon the use of this scheme and '*stick with Grade 1 only approach.*' Another noted how the scheme had been changed into an uncontracted version ('*We have put this into Grade 1 for better or worse and indeed my colleagues have used it, for want of anything else I think*').

Linked to this, in describing use of the scheme alongside other literacy approaches, one respondent noted that the scheme does not '*fit with curriculum phonics*' (presumably a reference to mainstream phonic instruction) with another reporting that:

- *I had a lot of grief from the class teacher, as the scheme is not "levelled" to NC, so we had to use [Oxford Reading Tree] books as well to show progression.*
- *We managed to run it alongside the new phonics work, but only by removing the child for extra braille lessons*

Summary

Responses suggest polarised views in terms of perceived strengths/weaknesses. It appears that the scheme's 'traditional' format in relation to introducing contractions provides a strong platform if this is the approach taken by the teacher. Even so, additional resources and creative activities are required to ensure the scheme is suitably motivating to children (particularly those who are older). Consequently, many respondents described having developed associated resources.

In contrast, a clear tension appears to exist for teachers who want to deviate from the order in which the contractions are introduced, or even use no contractions at all. If this is the case, the scheme appears problematic, in particular if the teacher is trying to link a child's learning to other (print-based) reading schemes.

8.3 Take Off

Produced in consultation with the VIEW Braille Literacy Committee, the scheme aims to '*develop a child's phonic skills, and knowledge of braille contractions and wordsigns*'. It also seeks to encourage '*enjoyment of reading and writing*'. The course takes the learner to the end of contracted braille. Each booklet contains a practice page and story; booklets in series 1 to 10 also include a "fun page" of activities to encourage braille writing.

Seventeen respondents provided information on the perceived 'strengths' and 'weaknesses' of this scheme.

Reported Strengths

Nine respondents made reference to the relevance of story content to the child's interests as being particular strengths of the scheme, e.g.:

- *[The scheme] moved the pupil on quickly - he really liked the content.*

- *Great range of interest reflected in each of the series and was perfectly acceptable to my adolescent learner!*
- *Its themes are far more creative and imaginative….provides exposure to braille in such a way as to allow children to really grasp the code.*

Respondents made explicit reference to the scheme's structure as being strength of the scheme, as well as how the scheme usefully progressed from other schemes:

- *The structure of the scheme is a strength. It enables parents, teachers, ATOVIs, TAs etc to know exactly where the child is with the braille code.*
- *Excellent progressive follow on from Braille for Infants.*
- *We now use this [scheme] to transfer pupils to [contracted braille].*

Internal progression within the scheme was also viewed by four respondents as being a particular strength of the scheme:

- *Gradual introduction of signs. Structured route through the [braille contraction] signs; practice and extension pages are good.*
- *Systematic approach.*
- *Introduces new braille signs in a pretty consistent way.*
- *Level of reinforcement in books (within a level) of braille signs is helpful.*

One respondent suggested that while the scheme was '*great to use*', additional '*tailor made*' resources were drawn upon to:

- *[..] stimulate young minds and encourage motivation through competition e.g. via setting up a 'games' type situation, e.g. Braille Bingo and Noughts and Crosses in braille using learned braille letters/signs/shortforms and whatever braille the children have been exposed to in the reading scheme'*

Reported weaknesses

In contrast with the reported strengths of the scheme referred to above, five respondents made reference to its more limited relevance of the content to the children they support, e.g.

- *Some of the story content is not in child's experience and difficult to support with real objects.*
- *Rather old-fashioned material.*

- *So dull! My seven year old Braillist cannot believe the lack of interesting vocabulary or story line. As he reads, he deliberately changes words to improve the [vocabulary] and sometimes reads the opposite word to the one read for fun. Its dullness has become the main enjoyment of the lesson!*

Other weaknesses reported by respondents made reference to specific aspects of the format/design of the scheme e.g.:

- *Some books less interesting and introduce too much in one book.*
- *Lack of the capital (braille sign).*
- *All of new braille signs are introduced on first page of new level. This is rather too much for some children.*

Summary

As with Braille for Infants, responses are mixed in terms of perceived strengths/weaknesses. Although the comments were not as polarised as those for Braille for Infants however, it appears that the scheme's 'traditional' format in relation to introducing contractions provides a strong platform if this is the approach taken by the teacher. Indeed there is evidence that teachers use the scheme to introduce contractions to children who had learnt uncontracted braille up to that point ('*We now use this [scheme] to transfer pupils to [contracted braille]').* Weaknesses seemed to be related to the content of the material (some finding it 'dull') and some specific points regarding the structure and implications that the scheme needs some updating (e.g. braille capital sign)

8.4 Abi books

These stories are based on the adventures of a six-year old blind girl. A print version of the text appears on facing pages to encourage paired reading, and enables parents and others to enjoy the books with the braille learner. Capitalised braille is used throughout.

Nineteen respondents provided information on the perceived 'strengths' and 'weaknesses' of this scheme.

Reported Strengths

The majority of respondents made reference to the relevance of story content to the child's interests as being particular strengths of the scheme, e.g.:

- *Great stories. Pupils love the characters and the themes! Particularly the 'stink bomb' books and the 'castle' story. Great to have 10 more books in the scheme.*
- *Children love these books. Abi is a popular character as is naughty Billy.*
- *Pupils we have used the books with enjoy them.*
- *My girl braillists love it!*

Three respondents made explicit reference to how the scheme's humour appealed to the children. Similarly, a number of respondents made explicit reference to the characterisation in the books as being a particular strength, allowing the children to empathise or relate to the main character, e.g.:

- *Children love the fact that Abi is blind*
- *Good to have blind main character in stories*
- *About a blind child who isn't perfect – comical*

Particular design features of the scheme that were identified as strengths, includedthe introduction of contractions, size of books, and the print/braille on facing pages, e.g.:

- *Nice little stories. Books a good size.*
- *Steps in learning contractions, word signs etc suited our pupils very well.*
- *Enjoyable story themes introduction of contractions text alongside for a peer or parent to share*
- *Print means they can be shared with sighted peers for shared reading.*
- *Great stories, lend themselves to art work, drama etc. fun to read, child friendly, enjoyed by both boys and girls, parents like them.*

One respondent described how the book had been '*transferred'* into uncontracted braille and as a result '*has been instrumental in promoting fluency and confidence*'. Others described how they used the scheme in a variety of ways:

- *Runs alongside 'Take Off' to provide greater breadth.*
- *I didn't use Abi as a scheme, rather as additional reading.*
- *One child loved to tell the Head all about each story daily.*

- *Sighted peers in school liked to listen to them being read by pupils with a VI.*

Reported weaknesses

Whilst few weaknesses were reported, a number of respondents raised cautionary points (relating to the humour which they felt may not work in all contexts (*'One story mentioning putting a drawing pin on a chair. Not very PC [..]', 'Some stories would not pass health and safety'),* and the characterisation (*'Our male pupil refused to read them!'*).One respondent made reference to the length of the books as 'too long' in comparison with Braille for Infants, with two respondents noting the lack of additional stories.

Summary

There was broad enthusiasm for this reading scheme. The content was broadly seen as engaging and motivating for children. The structure and presentation qualities of the scheme (in particular the print and braille on facing pages) appears to provide opportunities for work with sighted peers and non-specialist teachers. Most respondents who had used the scheme appeared to find it useful in some way (whether as a scheme in itself, as a supplement for other schemes, or just as a source of additional reading materials).

8.5 Oxford Reading Tree

This print reading scheme is designed for use by fully sighted children in primary schools. Books from the scheme have been adapted for braille users, and are available in both contracted and uncontracted versions. The braille is embossed on interleaved clear plastic sheets, so that the pictures and print story can be seen underneath. This is intended to enable shared reading between sighted and blind readers, such as parent and child, teacher and child, friends. A more recent edition (2007) includes the capital letter sign and the 2004 braille code changes.

Thirteen respondents provided information on this scheme.

Reported Strengths

As might be expected the majority of respondents made reference to the inclusive/mainstream aspects of the scheme, allowing it to be read alongside sighted peers and using the same content. This can be illustrated through the following quotes:

- *Reading alongside peers in class makes [for] a very positive experience*
- *Can be used with sighted peers (and) siblings. Same [material] as peers are reading.*
- *Listening to the stories enables the blind children to be included and aware of the themes that their class mates are reading.*
- *Used by siblings in other schools which was magic for the child in the reception*

The characters in the scheme were reported by four respondents as being a particular strength of the scheme (e.g. '*Children like them very much and that says it all*'). Other design features that were identified as strengths included good vocabulary, puppets provided as additional resources, and the story content.

In referring to how the scheme was used in practice, one respondent reported that it was drawn upon '*to supplement other schemes rather than as a main scheme*' with another reporting that it was '*used for reading at home books*'. Two respondents described the particular adaptations made to ensure the scheme had relevance to a blind child:

- *I think this could be read to the blind child with pictures explained AFTER they have done their braille scheme reading, so that they know the stories their peers are 'hearing'.*
- *No pictures, and much of the humour comes through these, so we only used the ones we considered appropriate, or if the school needed to use it for levelling [National Curriculum] levels, or if the parent wanted to read a "normal mainstream book" with their child.*

Reported Weaknesses

A number of respondents made reference to the order of introduction to the braille code as a perceived weakness of the scheme. This is perhaps inevitable given that the scheme is simply a translation of an existing print-based scheme. For example:

- *No gradual introduction of braille. Child needs a significant amount of braille knowledge to be able to read even easy stories*
- *Not the structure there is with the braille reading schemes*

One participant recognised the tension but explicitly felt the trade-off was worthwhile (*Not following usual order in which I would teach braille - but the benefits are worth it*). Nevertheless, two respondents made particular reference to when they felt the materials would be overwhelming for some learning to read through braille:

- *A lot of punctuation at an early level, making it quite off-putting for slow/reluctant braillists.*
- *Some books have too many contractions to learn at once. A clever child can cope but others find them too much. Some books have few new contractions in.*

A number of respondents drew attention to the limitations of adapting a print based scheme into braille. As an example one reported that the use of whole words rather than a synthetic phonics approach '*makes it difficult for children who have phonological delays or difficulty with acquiring phonic skills, to access*'. Another respondent reported that s/he would not draw on the scheme to teach braille as:

- *[..] there are oh so many 'Oh No! and other repetitive words that may be humorous for sighted children but offer no real teaching element to blind children who, frankly, don't have time to waste when learning to read and write*

One respondent was firm in the view that the scheme was inappropriate for use by blind children:

- *This should NOT be used by blind children. It is a 'sighted world' BUT why use inappropriate material for early learning.*

Whilst reference to the use of pictures was identified by two respondents as being particular weaknesses, another felt it could be worked around positively:

- *Blind children can't use the picture clues making many of the stories unrewarding without explanation*
- *Many [weaknesses] for the blind child. It uses sight words like 'everyone' with many braille contractions and heavily relies on the excellent pictures for content, humour and reading help.*
- *The pupil I work with loves having the pictures described to him and where possible has chance to explore real objects linked to the stories.*

Although the scheme is available in either contracted and uncontracted braille, the limitations of producing the scheme in *either* contracted or uncontracted braille was reported by one respondent as being a weakness given that there is '*No gradual progression of adding rules and contractions.*' Linked to this, two responses suggest there is some confusion as to which books are available in which format.

Summary

The Oxford Reading Tree stands out as unique as it is a scheme for teaching reading through *print* which has been translated into braille. Unsurprisingly this approach has both advantages and disadvantages. For many teachers the advantages of being able to 'connect' the teaching of literacy with the work of sighted peers and parents seems to be a key reason why many appear to make use of the scheme. Whilst some respondents reported using it as a reading scheme, others made reference to its use as supplementary reading material alongside other schemes. A key challenge is that the order of introduction of braille letters (and particularly contractions) is not accounted for in the scheme. Again this links with the chosen approach to the teaching of contractions – an uncontracted version of the scheme may be appropriate when uncontracted braille is taught (although evidence suggests that not all practitioners are aware of uncontracted and contracted versions of the scheme). For those teachers who are more committed to teaching contractions in a particular order, the scheme is viewed more cautiously (even negatively).

8.6 Reading Together

This scheme was designed for use with 'young children' (no age given in summary) to encourage emergent reading and writing. Five or six letters with associated braille contractions are taught prior to the child reading the 'real' story. The scheme includes print text above the braille and is based on a series of stories about Kali, Kai and their friends and family. Levels 1 to 3 have a full text on the left-hand page, with a simplified version of the same on the right. The learner can read the simplified text and scan through the full text to look for familiar signs and words (indicated in bold print for a sighted reader). Levels 4 and 5 are designed to be completely readable by the learner. The Reading together core pack comprises 10 stories - two at each level, and the teachers' notes in

print. The Reading Together extension pack comprises 10 stories plus accompanying teachers' notes in print - adding two more stories at each level for the child to choose from.

Six respondents provided information on the perceived ‘strengths’ and ‘weaknesses’ of this scheme.

Reported Strengths

Three respondents identified the potential of the scheme for use as a supplementary resource e.g. *‘[Provides] back-up material for Braille for Infants; real stories; extension material through use of additional shortforms and dot 5 signs’, ‘It could potentially be a good extra scheme for less able children alongside [Braille for Infants] and Take Off’, ‘Useful consolidation and great to read with pupil's blind volunteer - they had a book each!*

The design of the scheme (i.e. with the adult reading the initial words – the ‘Reading Together’ scheme title) was reported by three respondents as being a particular strength. This approach was reported by one respondent as being ‘useful for slower readers’.

Reported Weaknesses

Two respondents reported that the scheme may not be appropriate for use with ‘more able’ braillists with one suggesting that it may have greater relevance for consolidating progress, e.g.:

- *I do not think it is necessary for most able children*

It was suggested that the scheme by itself was not suitably comprehensive (i.e. ‘*not enough of it’*), ‘*needs supplementing with other books*’, and the scheme was only ‘*good as part of a range of resources*’:

- *I think there is a potential market for more well written braille schemes with different interests and this provides an extra avenue.*
- *Very good descriptions for pupil to build up his own picture of the characters and situations.*

Summary

Responses suggest the scheme is not widely used and appears to be mainly used as a supplementary scheme for children who require consolidation /additional practice. The structure suggests that the pedagogical approach adopted within the scheme (explicitly describing adult/child partnership) may be very useful when working with volunteers and parents, as it defines the adult role in the practice / teaching.

8.7 Braille in Easy Steps

This scheme was designed for 'latecomers' (pupils between the ages of about 10 to 14) who are 'literate in print but are transferring to braille'. No previous knowledge of braille is assumed, and the emphasis is on 'reading'. The material is introduced in small steps, with practice reading material in the form of quizzes, activities and stories. Longer stories are accompanied by tactile maps and plans to add interest, and develop search and scan techniques. The capital letter sign is used throughout.

Eight respondents provided information on the perceived 'strengths' and 'weaknesses' of this scheme.

Reported Strengths

Perhaps not surprisingly, given its focus, three respondents identified the particular strengths of the scheme as being its potential to be used as a resource for older children who are developing their skills in braille: '*Gets literate kids reading again quickly'*, '*Interesting and varied texts to read'*.

In terms of its design features one respondent made reference to the scheme being '*well structured'* with another noting that the '*tactile plans are good'*. The fact that the scheme is published in braille/print was reported by one respondent as being a particular strength as it was considered to be *'straightforward for a support assistant who had little knowledge of braille to pick up when required.*'

Reported weaknesses

In terms of its broader relevance two respondents made reference to the scheme as being '*old fashioned'* with one reporting that it '*can be a bit dull for some pupils'*. Two respondents also made reference to the difficulty in recording progress and students' previous experiences:

- *(The) order of introduction of signs does not always fit in with what students have done in the past.*
- *To use this properly in school you need tools to measure the student's attainment. A photocopyable checklist of signs learned so far would have been useful.*

Two respondents made comparisons with other similar schemes they had preferred or thought more popular (Fingerprint, Braille in Easy Steps, Abi scheme).

Summary

Responses suggest the scheme is not widely used in practice in the UK and appears to be mainly used as a supplementary scheme. Probably of greatest relevance is that the key target purpose of the scheme is for children who are learning to read through braille having already learnt (or at least begun to learn) to read through print. Even so, respondents identified other schemes which could be used for this purpose.

8.8 Get Going

Published in 1999, the scheme was developed with Scottish funding and contains a range of stories incorporating Scottish culture. It is designed for the learner who needs to progress at a slower pace. The print version of the stories is shown on facing pages to help with paired reading and capital letters are indicated in the braille. The scheme comprises 30 books - five books in each of the six series. The scheme is now out of print.

One respondent provided information on this scheme, reporting the strengths as:

- *Supports the learning of [contracted] braille, providing breadth*

They reported the weaknesses as:

- *Rather dull and dated compared with Abi but quite well liked*

8.9 Other Schemes

Some respondents described using schemes not included in the list presented in the survey. Four described using Fingerprint which was developed by Nigel Berry in 1993. It is described in an RNIB Factsheet as 'widely-used course is designed to teach newly blind adults to touch-read and write [contracted] braille from scratch. It may be taught or used as a "teach yourself" course.' The scheme was described generally positively for use with older students and/or good for revision. One participant also described 'Spot the Dot' positively for similar purposes.

Two participants referred to two separate US-based schemes: 'Un's the One' (available from Texas School for the Blind and Visually Impaired) – an uncontracted scheme involving tracking exercises; and Primary Phonics (published by the National Braille Press) which has contracted and uncontracted braille on facing pages with simple consonant-vowel-consonant words.

Two other schemes were described which had been developed within given services (one was uncontracted in response to the needs of a particular child). Each was well regarded and used by the given respondent.

8.10 Published and in-house teaching resources

The final question explored if participants made use of other resources (published or in-house) in teaching literacy through braille. In terms of published materials, ten respondents made reference to 'Clearvision' books as a useful resource in their teaching. Use of the RNIB library was mentioned by two respondents. Reference was also made by one respondent to materials i.e. materials developed by Sally Mangold in the USA. Others mentioned transcribing print-based materials which were used by other children in the classroom. This general theme of transcribing print-based material was also discussed by a number of respondents in terms of in-house resource development i.e. respondents described creating resources which supplemented reading schemes with the aim of practicing particular aspects of literacy, or personalised content to help maintain interest and motivation. Similarly, the development of games were mentioned by some respondents, with

others describing developing specific material for students with particular needs (learning difficulties, deafblind) or interests.

In terms of how these in-house materials were used it is interesting to note 16 respondents made reference to one-to-one adult-based activities, compared to only two references to ‘independent work’. Of additional interest was the finding that thirteen respondents referred to the development of materials which could be sent home for work with parents.

8.11 Overview of key issues

The findings from the survey offer a useful snapshot of current practice in the field and serve to identify a number of key issues that have relevance to the focus of this review. The feedback suggests for example, that there appears to be a trade off in many of the existing braille reading schemes between the development of decoding skills and the availability of meaningful content. In relation to the three models of literacy instruction introduced earlier in the report (section 4) this can be broadly captured as a distinction between ‘skills centred’ and ‘meaning centred’ models. Participants’ responses for schemes such as ‘Braille for Infants’ reflect this divide, broadly praising the reading scheme for the ordered way in which braille signs and contractions are introduced, but criticising it for the lack of relevance and interest in the story lines. Schemes such as the Abi books seek to address this tension between developing texts that are meaningful and texts that allow for an ordered introduction of the braille code, and meet with general approval from respondents to the survey. Further, the introduction of literacy through uncontracted braille is seen by some respondents as allowing scope for development of a more flexible ‘meaning-centred’ approach than that available in schemes such as Braille for Infants. Within such an approach it can be argued that the content is not determined by the need to restrict vocabulary to words that contain signs and contractions that the child has already learnt.

The broad principle that children using contracted braille benefit from ordered instruction is well established in the pedagogical literature. There appears to be support for this principle among respondents, with a number indicating that the development of braille literacy should be underpinned by schemes specifically designed to introduce contracted braille in a logical and ordered manner. The ordered introduction of signs and contractions through the scheme offers a structure that might otherwise be missing in a child’s instruction. As one respondent notes,

reading schemes specifically designed for children who use braille in mainstream school may offer a 'fail-safe' in situations where there is limited expertise in teaching literacy through braille.

The responses raise the question of whether more resources should be put into developing transcriptions of print based reading schemes, similar to the Oxford Reading Tree, that are designed for children who are sighted. The polarised views suggest perhaps that teachers' response to this question depend on whether they believe proficiency in contracted braille is compromised by a delay in the introduction of contracted braille. Further, as well as the perceived weaknesses / limitations of the scheme reported above, a number of respondents, reported how the scheme is used to *supplement* reading through other published schemes rather than as a dedicated braille scheme by itself. As an example, one respondent reported using the scheme *'alongside other braille schemes (because) it works well - but time is needed for withdrawal to teach contractions.*' Another reported that s/he does not consider this scheme to be a 'braille reading scheme', but rather it can be used as supplementary reading material for a child learning to read through braille. This was supported by another respondent who noted that:

- *We use this as take home reading to supplement Abi books read in school as these take longer to read so can't go home so regularly.*

Such responses suggest that a print reading scheme such as Oxford Reading Tree by itself is not generally used as a substitute for a dedicated reading scheme when introducing contracted braille, but rather has an important role to play in providing supplementary and importantly, inclusive reading material. There is broad consensus about the importance of drawing on such materials to supplement approaches based predominantly upon braille reading schemes, with the findings suggesting that these supplementary materials need to allow for:

- Interesting content that is relevant and meaningful to children who are blind and children who are sighted and allow for a 'connect' between the teaching of literacy through print and the teaching of literacy through braille;
- Flexibility of use – e.g. can be used for shared reading with adults and other children;
- Available in a range of formats, interleaved braille and print, uncontracted and contracted versions.
- Potentially the introduction of additional materials which may support motivation and meaning (e.g. tactile pictures, objects, sounds/computer-based activities).

9 Discussion: Resource and practice implications

In this section we seek to reflect upon the findings presented above, and in particular consider the fifth research question described at the beginning of this report: *What are the implications of the review findings for braille teaching and assessment resources (e.g. reading material, reading schemes, technology, braille assessment tools) and professional training?*

To do this we revisit the context in which children with visual impairment are taught literacy through braille and re-consider the findings presented in previous sections in this context. From this we draw out 'emerging implications'. In the final section the emerging implications are re-presented as recommendations.

9.1 Discussion: putting the findings into context

Support services

Although provision varies, in the UK most children with visual impairment are supported by local authority visual impairment services. Professionals often support pre-school children and their parents (and potentially nursery staff) as well as children when they enter school (often their local mainstream school). There are various models of in-school support involving different professionals in different ways. But relevant to this discussion is the involvement of teaching assistants (in their various roles), specialist teachers (often QTVIs or teachers training to be QTVIs), and the class teacher (who in the mainstream primary classroom will be the main person who is 'teaching literacy'). Key issues to consider here include the following:

- What are the roles of these staff in the teaching of literacy through braille? We cannot be certain, but from the evidence we have (most recently Bindman and Greenaway, unpublished), there is considerable variation in approaches to the teaching of braille literacy and the roles undertaken by these staff.
- There is also a changing context for service delivery. Budgets increasingly reside with schools and less with services. This means the staff described above (and/or others) may increasingly be providing their support to schools on a commissioned basis.

- There are few (if any) standards or guidelines for services or schools of what broad approaches to the teaching of literacy through braille might be expected. Such guidance would be helpful, especially given the shift of balance of control for the financing of support (from services to schools) in the near future.

Emerging implication: Standards and guidelines for services and schools for teaching literacy through braille would be helpful, perhaps building upon existing 'quality' standards (see for example, DfES 2002, DCSF 2008). In feedback on the draft review, practitioners suggested that the standards might usefully address:

- the monitoring of pupil progress with a focus on braille as a key element of the specialist curriculum,
- refresher training in braille teaching,
- the role of QTVI in leading the provision of braille teaching with support from other professionals (including a proportion of time involved in direct teaching),
- an expectation that QTVIs support each other – with less experienced QTVIs being mentored/ coached in braille teaching by more experienced QTVIs.

Numbers of children

- Only a small proportion of children who are visually impaired read braille, so professionals will often have little experience of, or opportunity for, teaching literacy through braille. Some services may have 'braille experts' who are assigned to particular children, but even so experience will often be variable in the service as a whole and in some small services virtually non-existent.
- Professional training programmes will offer some tuition on the topic of teaching literacy through braille (along with the learning of the braille code it is a required element of QTVI training), but: 1) it may have only been covered at a relatively introductory level and 2) for many teachers this training may have happened many years ago and may have been largely forgotten through lack of use.

  Emerging implication: Appropriate and timely professional training is required for those teaching children literacy though braille. Example solutions might include the creation of additional credit bearing and non-credit bearing courses for teachers and teaching assistants, second level training for QTVIs, availability of resources and guidance at a publically accessible location such as a web portal.

Teaching resources

There are a lot of useful teaching resources, including braille reading schemes (but not as many as resources available to sighted children learning to read and write print). Key issues to consider here include the following:

- In terms of early years' materials, it seems 'Feeling Ready to Read' is a key resource. It has a focus on pre-braille tactual development and is designed for use in the home. It usefully helps young children to establish links between words in their written form, tactile pictures and spoken language. A complementary resource that specifically seeks to support phonological awareness and development would be a useful in addition.
- Pre-school teaching support in the home and the nursery, and the opportunities it affords for individual attention, offers many possibilities for the encouragement of early literacy skills (including those particular to braille). Resources such as the 'Developmental journal for babies and children with visual impairment' (DfES 2006) are useful in structuring intervention and it includes reference to relevant themes such as phonological awareness and development.
- In terms of school-based activities, phonics work is also commonly undertaken in whole class or small group sessions and this could/should include children who are (or will be) learning literacy through braille.

Emerging Implication: Phonic training work should be promoted to ensure that young children (pre-school and reception/infant/KS1) have early exposure to books and braille materials in a way that helps them make a firm link between phonological skills and the braille written word.

The move towards group work and more formal 'reading schemes' in the classroom can present dilemmas for teaching of literacy through braille. This is illustrated when considering braille reading schemes:

(1) Specifically designed braille reading schemes are problematic because it can be difficult to link them to the work of other children in the class. They may inhibit opportunities for peer socialisation and reduce the opportunities for the class-teacher (who is a key 'literacy teacher') to work with the child.

(2) Print-based reading schemes converted into braille may have limited personal relevance to the braille reader (e.g. meaning may rely upon

associated pictures, or stories may relate to inaccessible topics). Conversion into contracted braille will almost certainly present challenges in relation to the order of introduction of signs and contractions.

Emerging implication: There appears to be a lack of guidance and appropriately structured reading material in relation to teaching literacy through braille specifically in the mainstream classroom, and this is particularly acute if children are taught uncontracted braille initially (this contracted-uncontracted debate is revisited below).

Other groups

- Young people who have already learnt to read through print and need to transfer their literacy skills to braille have particular needs. For these children, the issue is less about 'developing literacy through braille' than learning to transfer their existing literacy skills to a new medium – the braille code. The review has not covered this issue in any detail, but well established reading schemes do exist for this group (e.g. Braille in Easy Steps).

Emerging implication: The particular needs of children who learn braille having already learnt to read through print have not been explored in any depth in this review. It may be that the development of further resources is needed, but this needs clarification.

Children with learning difficulties / complex needs potentially require a different approach to teaching literacy through touch. In particular, an approach based around a focus on 'functional' applications of literacy may be appropriate for some of these children. In any event, all children who are blind should have the opportunity to engage with literacy at an appropriate level. In relation to the learning of braille for children with additional needs, the research suggests that consideration will need to be given to strategies for promoting opportunities for increasing the involvement of parents in the home, for developing materials designed to promote achievement in functional literacy, and recognition of the importance of persistence and collaboration in instruction.

Emerging implication: The particular needs of children with learning difficulties / complex needs and how they could be taught literacy through braille have not been explored in any depth in this review. It is likely that further research is needed into the efficacy of different

‘functional’ approaches to teaching which may be suitable for these children and young people.

Complexity of deciding the choice of media

Many children who are severely visually impaired have useful functional vision and it is important to identify the most appropriate primary reading medium (braille, print, or a combination of the two). Assessments to help with this decision are available (speed of access is a key factor), although there does not seem to be an agreed view upon what or how these assessments are applied (and, rightly, there are contextual factors which are also important – e.g. child and parental choice). Key issues to consider here include the following:

- The development of an updated version of the Learning Media Assessment (LMA) (Koenig and Holbrook, 1995), which may help overcome this apparent lack of clarity.
- Learning to read through braille and print in combination appears to be a legitimate, successful and sensitive route to literacy for some students.
- The thinking in relation to the interaction of technology and the teaching literacy through braille is under-developed and under-researched. However, it seems essential that children who are blind should have access to technology that will allow flexible access through *both* touch and hearing.
- Technology to support braille reading and writing, and access to electronic text is critical for older students who use braille – refreshable braille seems be less used in the UK, but this requires further research.

Emerging Implication: The development of a practical and readily available assessment procedure (or ‘rubric’) for supporting decisions about choice of primary literacy media would be helpful. Any such assessment (and related options/recommendations it provides) must make reference to the role of technology. A developed version of the LMA may be helpful in this respect.

Changing code – Unified English Braille (UEB)

British Braille is the standard code that underlies the development of literacy through braille in UK schools. As in other English speaking countries, British Braille has different codes for maths, sciences and computer braille. UEB is an attempt to create a single braille code which

could be applied across all subject areas (except music) and all English speaking countries. This would make it easier to translate (through the use of computer software) contracted braille to print and print to braille. It has already been adopted as the standard code by countries such as Australia. There is a move to recognise it as the standard code in the UK. Key issues to consider here include the following:

- The differences between British literary braille and UEB are small. UEB has no new contractions, nine current British braille contractions are omitted from UEB, and UEB does not allow the sequencing of words. According the Australian Braille Authority readers who are already familiar with literary braille will have little trouble switching to UEB.
- The Braille Authority of the United Kingdom (BAUK) decided against adopting UEB following consultation with braille consumers in the UK in 2008. BAUK has since merged into UKAAF but the decision is being kept under review and may change in the near future.
- In terms of implications for teaching literacy through braille, adopting UEB would involve: Updates of existing braille reading schemes and assessment materials for children; updates for some braille technology devices used in schools (although most modern devices have UEB as an inbuilt option); the updating of braille code training manuals for teachers, classroom assistants etc.; some retraining of professionals involved in teaching braille to children.

Emerging implication: A decision should be made quickly about the uptake of Unified English Braille (UEB) in the UK. This needs to take place before the development of the new resources recommended in this report.

Assessment tools

Accurate assessment of literacy performance is important for informing literacy teaching: assessment gives teachers an insight into pupils' progress and particular difficulties they may be facing. Key issues to consider here include the following:

- In the UK, there are currently no 'in print' standardised assessment tools related to braille reading. The most up to date assessment tool is the braille version of the NARA (Greaney et al, 1997) and this appears to be unique in that it has been standardised for braille readers *and* print readers.
- This valuable assessment enables the user to make meaningful comparisons with sighted children (e.g. comparisons in relation to

expected reading speeds for children of a given age), and enables comparisons across *braille* readers which enables meaningful diagnostic analysis of a child's reading.

- The Braille NARA is based upon contracted braille (using pre-1997 standards, i.e. no capitalisation). It would need updating to incorporate recent developments to contracted braille and / or uncontracted braille / and perhaps UEB.
- No broader standard assessment of braille literacy which incorporates writing appears to exist in the UK.
- Teacher's assessment of a child's progress in literacy will also be based upon less formal methods related to the child's engagement with different reading and writing activities e.g. progress through a reading scheme (braille or print), comparison with peers, progress / achievement in relation to national assessments (in England).
- There is an increasing pressure to compare the literacy performance of children who use braille with their sighted peers. While such comparisons can be useful they may also give a false picture of the performance of children who use braille. It is important to have a means of also comparing the performance of children who use braille to that of other braille users.

Emerging implication: There are concerns about the availability of tools for assessing the progress of children's literacy through braille. In particular, a strategy is needed to make available a new edition of the Braille NARA. Careful thought will be required to ensure a meaningful assessment exists which is in line with other policy decisions highlighted in this report (UEB, contracted/uncontracted), while also being mindful of the cost and time implications of re-standardising this test.

Contracted or uncontracted? - options

Unlike some of the other research questions, the issues of contracted or uncontracted braille represents a clear *choice* of approaches to teaching. This has wide implications. There are countries (such as Scandinavian countries and Japan) that do not use contracted braille at any point in a child's education. For the purposes of this report we are not considering such a change in the UK (this is a much broader question and seems an unlikely short term possibility given the existing resource and human investment in contracted braille and the ongoing debates in relation to UEB). We are assuming here that the eventual target of literacy instruction is contracted braille and that uncontracted braille is a route towards mastery of contracted braille and not an end-point in itself (although it might be for some).

Implications of this *choice* are considered here for the reading schemes and teaching materials that are available, and for the assessment materials that are needed. A consideration of UEB is also relevant because its possible introduction may also require a re-working of reading and assessment materials, and reading schemes, and a decisions about contractions and 'contractivity' could be linked to decisions about UEB.

The evidence for or against uncontracted braille is not conclusive, however:

- Concerns that starting learning to read through *uncontracted* braille holds back reading because children having to re-learn words in different (contracted) forms seem unduly pessimistic given the inevitable overlap between contracted and uncontracted braille discussed in the review. There is currently insufficient conclusive evidence to support the view that uncontracted braille impacts negatively on reading speed, reading accuracy, comprehension, and spelling.
- Concerns that learning through *contracted* braille from the start holds back development of social interaction also seems unfounded, nor is there any persuasive evidence for the view that contracted braille inhibits fluency in the development of hand movements or spelling.
- Resources for children developing literacy through contracted braille are well established. However there are few resources that are specifically designed for children introduced to literacy through uncontracted braille. Given that we know that numbers of children are developing their literacy through uncontracted braille, some careful thought needs to be given to the development of materials in uncontracted braille and, crucially, of materials that allow for the transition from uncontracted to the contracted form in an ordered way.
- Further research may provide a more definitive answer, or may show that it does not matter whether contracted or uncontracted braille is learnt first in terms of longer term literacy outcomes for children.
- Decisions about whether a child should initially be taught literacy through contracted or uncontracted braille must be judged on other factors that fall beyond general research findings related to overall children's reading performance. Given the potential advantages of uncontracted braille for the management of literacy teaching in mainstream classrooms (e.g. unification of reading materials for sighted and non-sighted pupils, alignment of phonic instruction), it should be recognised that using the uncontracted alphabetic braille

code is felt to be a legitimate and useful approach to teaching literacy through braille by increasing numbers of practitioners in the UK.

- Nevertheless, while the broad approach of using uncontracted braille at the beginning of literacy education seems suitable and appropriate for many children (compared with starting with contracted braille), there is an absence of guidance which helps teachers (and parents) make this decision. Just as important, there is an absence of guidance as to how, and at what point, braille contractions should be introduced.

Emerging implication: The development of clear guidance for teachers of literacy through alphabetic *uncontracted* braille seems essential. It would be useful to offer guidance (and related materials and reading schemes) to support teaching literacy by initially using an uncontracted code. It would also be useful to offer guidance and resources about decision making in relation to how and when contractions are introduced.

9.2 Recommendations

In this final section we develop recommendations drawing upon the emerging implications drafted above. The recommendations are gathered under four headings:

- **National/regional providers.** These recommendations focus upon policy makers and lobbying groups. This includes voluntary organisations (e.g. RNIB, NBCS), government and related agencies, organisations responsible for writing standards and guidance, and teacher groups (e.g. VIEW). It also includes producers of braille teaching resources and publishers.
- **Training providers.** This includes teacher trainers, teaching assistant trainers, and organisations that provide inset training and professional development generally.
- **Local education services.** This includes visiting teacher and support services, schools, teachers and other professionals involved in directly supporting literacy education through braille.
- **Other issues.** This covers other general issues including topics we do not believe have been covered in this report (but are linked to the teaching of literacy through braille), and this includes topics which warrant further investigation.

National/regional providers

Recommendation 1: Standards and guidelines for services and schools for teaching literacy through braille would be helpful. These could build upon the existing 'Quality Standards in Education Support Services for Children and Young People with Visual Impairment' (see DfES 2002), and in line with the Quality Standards for Special Educational Needs (SEN) Support and Outreach Services (see DCSF 2008) adding additional guidance in relation to the teaching of literacy through braille.

Recommendation 2: Guidance and resources for teachers are needed regarding teaching literacy through braille generally, and on decision-making in relation to the introduction of the contracted and uncontracted code in particular. Based upon available evidence and the UK education context, the authors believe that unambiguous guidance about using uncontracted braille for teaching literacy through touch would be helpful. Teaching resources for teachers who choose to introduce literacy through uncontracted braille are also required, including guidance

relating to when and how to introduce braille contractions. This recommendation particularly lends itself to the development of an online 'portal' of resources for teachers.

Recommendation 3: The development of a practical and readily available assessment procedure (or 'rubric') for supporting decisions about choice of primary literacy media would be helpful. Any such assessment (and related options/recommendations it provides) should make reference to the role of technology. Given recent work by RNIB, a developed version of the Learning Media Assessment (LMA) (Koenig and Holbrook, 1995) may be helpful.

Recommendation 4: A decision should be made quickly about the uptake of Unified English Braille (UEB) in the UK. This needs to take place before the development of the new resources recommended in this report.

Recommendation 5: The development of a braille reading scheme which is specifically designed for use in mainstream classrooms is needed.

Recommendation 6: Linked to the development of a braille reading scheme is the general issue of assessment of progress of children's literacy through braille. In particular, a strategy is needed to make available a new edition of the Braille Neale Analysis of Reading Ability (NARA). (The current version of the NARA is currently being re-printed and re-stocked by RNIB.) Careful thought will be required to ensure a meaningful assessment exists which is in line with other policy decisions (most notably UEB, and contracted/uncontracted braille), while also being mindful of the cost and time implications of re-standardising this test.

Recommendation 7: Consideration be given to the development of a nationally recognised braille curriculum and the promotion of recognition/accreditation of braille skills in national assessments.

Training providers

Recommendation 8: Appropriate and timely professional training is required for those teaching children literacy though braille. Example developments to existing training might include:

- The review and possible revision of approaches in existing training programmes in relation to teaching literacy through braille;
- The creation of additional credit bearing and non-credit bearing courses for teachers and teaching assistants in this area;
- Second level training for QTVIs;
- Interactive resources and guidance at a publically available location such as a web portal.

There are a variety of providers who might be involved in this process including existing providers of training programmes.

Local education services

Many of our draft recommendations are linked to the development of guidelines and resources. Implicit in this is a belief that educational services should follow these guidelines, i.e. have clear decision making processes for deciding on contracted / uncontracted code, embedding phonological training in pre-school and KS1 education, etc. Ensuring consistency of approach between different schools and local authorities will require the development of a professional infrastructure which currently does not exist.

Linked to this is ‘who’ does the teaching (a good question asked by reviewers of the previous draft of the report). Unsurprisingly, there do not appear to be any studies which explore ‘different professional involvement’ as a variable in relation to outcomes teaching literacy through braille (although there are some more general studies and ‘expert views’). Perhaps inevitably, the ABC study concluded the importance of consistent high quality teaching as a key factor for good progress in literacy through braille. Nevertheless, research studies (into literacy generally, not just literacy through braille) tend not to address such ‘large’ / ‘policy’ research questions directly. On this issue it might be helpful to discuss comparisons with what might be expected for the teaching of literacy to sighted children. We would expect sighted children to be taught literacy by teachers qualified and trained to do so, therefore it would be logical to expect the same for children who are taught literacy through braille. It seems important to emphasise that learning literacy through braille is not just an issue of ‘access’ through a different code. Children developing literacy through braille require specific pedagogical approaches that are different from those required by print readers and therefore the class teacher in a mainstream classroom requires support from specialist teachers with a sophisticated knowledge of the issues.

Other issues

Recommendation 9: The particular needs of children who learn braille having already learnt to read through print have not been explored in any depth in this review. It may be that the development of further resources is needed, but this requires further review and clarification.

Recommendation 10: The particular needs of children with learning difficulties / complex needs and how they could be taught literacy through braille have not been explored in any depth in this review. It is likely that more research is needed into the efficacy of different ‘functional’ approaches to teaching which may be suitable for these children and young people.

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Assessment Tools

Texas Primary Reading Inventory (TPRI, 2003)
Johns Basic Reading Inventory (Johns 2003)
Brigance Comprehensive Inventory of Basic Skills (BRI, Brigance 1999)'

11 Glossary Appendix

11.1 Question 1: Phonological Training

Phonological awareness

The ability to detect, manipulate and analyse the sounds in oral language, including the ability to distinguish, segment and blend syllables, rhymes and phonemes (NELP, 2008). Sighted children learn to associate the sounds of oral language with the letters that represent the sounds in print. Print readers with good phonological awareness skills learn to read earlier than do children with less advanced skills even when intelligence, vocabulary, memory and socio-economic factors are taken into consideration (Hatton et al 2010).

Phonics

A method of teaching beginners to read and pronounce words by learning to associate letters or letter groups with the sounds they represent.

Phoneme

The smallest unit of speech distinguishing one word (or word element) from another (e.g., the sound *p* in *tap*, which differentiates that word from *tab* and *tag*). The term is usually restricted to vowels and consonants (e.g. see Britannica Concise Encyclopaedia 2004-10).

Grapheme

A written symbol, letter, or combination of letters that represents a single sound. Most commonly a letter of the alphabet e.g. *f*, although it can also refer to the combinations of letters that can make the same sound as the letter e.g. PH (photograph) or GH (cough).

Morpheme

An individual unit of meaning in a word. For example, the word *unbreakable* may be analyzed as consisting of three morphemes: *un*, *break*, and *able*.

Onset and Rime

Single syllable words can be split into two parts - the onset and the rime. The onset is the initial consonant sound (b- in bag, sw- in swim), and the rime is the vowel and the rest of the syllable that follows (-ag in bag, -im in swim).(Education.com) Rimes may provide an important key to word identification and decoding. For example, when children know the ‘ay’ rime and can recognize ‘say’, they can use this knowledge to pronounce ‘tray’: they identify the -ay rime and blend ‘tr’ with ‘ay’ to decode the word.

CVC Words

Consonant-Vowel-Consonant (CVC) words such as ‘mum’, ‘hat’.

11.2 Question 2: Uncontracted and contracted braille

Contracted and uncontracted braille

Contracted braille, often referred to as ‘Grade 2’ braille, involves the use of the traditional alphabet, along with 189 different signs and contractions that represent groups of letters or whole words.

Uncontracted braille, often referred to as ‘Grade 1’ or ‘alphabetic’ braille, uses no contractions and maintains a letter-for-letter correspondence with print.

Two Handed movement patterns (after Wormsley 1979)

Left Marks: left hand is used as a marker, remaining at the start of the line while the right hand reads and moving down to the next line as the right hand comes to join it.

Parallel: two hands remain together at all times moving across the line from right to left and then dropping down to find the start of the next line.

Split: two hands remain together until nearly the end of the line and then the left hand splits away to find the start of the next line while the right hand continues reading the last part of the line and then joining the left hand.

Scissors: both hands read independently of each other and the left hand reads to the middle of the line where the right hand joins it and continues reading while the left hand moves to find the start of the next line.

Movement Characteristics:

Scrubbing: moving finger up and down over a character rather than moving smoothly across it (Mangold 1978)

Regression: one or both hands move briefly back to re-read or check context (Wormsley 1979).