# Braille in the 21st Century

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## Adoption of UEB in Australia - Context

Between 1869 and the mid 1970s, segregated education in residential institutions such as the Institution for the Deaf, Dumb and Blind was one of the very few options for parents of children with blindness and low vision in Australia. The teaching of British braille was the accepted norm, reflecting Australia’s colonial history.

The stirrings of social change reached Australia’s shores in the 1970s, and state governments across Australia accepted responsibility for education of children with disabilities. The gradual transition from segregated to mainstream education, combined with advances in development of computer braille translation software in the USA, resulted in Australia’s adoption of a complex hybrid system of braille codes. British braille with American capitalisation rules was used for literary material, the American braille code for computer-related material, and an Australian braille code for mathematics and chemistry material (Howse, et al., 2011).

In May 2005, Australia took the historic step of adopting Unified English Braille (UEB). This action was the culmination of almost 15 years of active participation in the UEB project committees of the International Council on English Braille (ICEB). The Australian Braille Authority, together with the Braille Authority of New Zealand Aotearoa Trust, led the transition to UEB in both countries. Their contributions included development of UEB training manuals and other resources, and provision of training opportunities for braille teachers, staff of braille production centres, organisations of and for persons who are blind, and learners and consumers of braille.

## NextSense and its braille offerings

In 1860, eight years after Louis Braille’s death at age 43, the Deaf and Dumb Institution was established in Sydney, Australia. The Institution was the first in Australia to provide education services for children who were deaf. In 1869, services were expanded to include children with blindness and low vision, with a title change to the New South Wales Institution for the Deaf, Dumb and Blind. In 1957, Queen Elizabeth II conferred the prefix “royal” in the title, and in 1973, the title was changed to the Royal Institute for Deaf and Blind Children (RIDBC). The current title, NextSense, was adopted in 2021.

NextSense has advanced and expanded over the past 164 years, and delivers world-class education, cochlear implant, allied health, therapy, research and clinical services for children and adults with sensory impairment, and the professionals and families who support them. NextSense is committed to research and innovation, harnessing the latest accessible digital technologies to support the next generation of professionals in hearing and vision services.

For the two decades prior to 2014, NextSense (RIDBC) had offered in-person and distance education training courses in braille. Enrolments each year consisted of approximately 40 to 60 specialist and mainstream teachers, and post-graduate students completing their studies in sensory disability with Australian universities that were affiliated with NextSense.

In 2012, in response to requests from educators and braille consumers, NextSense established a UEB team to explore the possibility of transitioning from in-person to online training in UEB. The team consulted with Australian and international colleagues and reviewed existing braille training courses around the world. The review identified several in-person and distance learning courses, but an absence of online, self-paced, self-marking courses in Unified English Braille. The team concluded that online instruction, offered free or at low cost, may be of interest to persons teaching and supporting braille learners in low, middle, and high-income countries. The courses would be designed to allow subscribers to create their own account with a personalised password on a UEB website. They could then work at their own pace through the course content, saving, closing, and returning to their personalised account at any time.

Project funding was sought and in 2012, the UEB team commenced work. The first training program entitled UEB literacy training program for sighted learners was launched by NextSense (formerly RIDBC) in mid-2014. An accessible version was added in 2015, and the two programs were merged into one fully accessible program in 2019.

## Target beneficiaries

The target beneficiaries of the NextSense braille offerings are basically anyone who wants to learn Unified English Braille. Subscribers to date have included mainstream and specialist educators, researchers, parents/caregivers, braille production personnel, and organisations of and for persons with disabilities from more than 150 countries. The programs have been incorporated into international higher education disability programs and adopted by ministries of education for pre-service and in-service teacher training.

The ultimate beneficiaries are children and young people with blindness and low vision. Teacher knowledge and skills in braille are essential in supporting and promoting equitable access to education and pathways to employment and independence.

## UEB Literacy training program

The UEB Literacy training program consists of two modules containing 30 lessons. Each lesson includes print-to-braille and braille-to-print exercises. The first 14 lessons are presented in Module 1 and address the basics of braille, including the alphabet, basic punctuation, simple word signs and group signs. Lessons 15 to 30 are presented in Module 2 and include complex two-cell contractions, short forms, group signs, additional punctuation, numbers, print symbols, braille mode indicators and type forms, capitalisation, proper names, print abbreviations and unit abbreviations. Instant, automated feedback is given when an error is made during exercise completion and errors must be corrected before continuing with the exercise. The rigour of this approach to learning supports the progressive building of braille knowledge and mastery of content.

The modules are offered free of charge, with an optional administration fee of AU$50 for a Certificate of Completion.

## UEB Mathematics training

Three Mathematics training programs were added to the UEB Online website between 2019 and 2021. The purpose of these programs is to clearly articulate the use of UEB for reading and writing mathematical symbols and expressions during the primary, junior secondary, and senior secondary years of education. Each program consists of a series of lessons and accompanying print-to-braille exercises that address specific topics in mathematics.

Subscribers are encouraged to complete the UEB literacy modules before embarking on the Introductory UEB mathematics program, followed by the Advanced Mathematics, and finally the Extension Mathematics program. Each program is supported by an open access manual, authored by Josie Howse, and available for download from the Resources section of the UEB Online website. The three mathematics programs are also offered free of charge, with an optional administration fee of AU$50 for a Certificate of Completion for each program.

## UEB Competency examinations

In the years following the 2014 launch of the UEB Online website and first training program, NextSense has received requests to expand its braille offerings to include examinations of competency in Unified English Braille. These requests were often related to employment, career progression, and the braille requirements of tertiary-level study in the field of disability. The NextSense UEB team responded by undertaking a review of existing braille examinations and certificates. They found several in-person and distance learning braille courses are offered by several organisations, particularly in North America, but found limited online, automated examinations of UEB competency.

In 2023, NextSense launched four, open book braille competency examinations in UEB Literary, UEB Introductory Mathematics, Advanced Mathematics, and Extension Mathematics. There are four variations of each exam, and selection of the exam is randomised for each candidate. The UEB Literary competency exam consists of a 1000-word print-to-braille translation of a text passage and 20 multiple choice questions involving identification of correctly brailled sentences. The UEB mathematics examinations each contain 40 questions involving translation from print to braille of mathematical expressions. The exams follow the content taught in the corresponding UEB Online training programs.

An administration fee of AU$70 is required for each examination at the time of registration. Once an exam is purchased, the candidate has 90 days to commence the exam and 14 consecutive days to complete and submit the exam once it is started. To prevent the exam timing out on day 15, an extension request must be submitted prior to day 15 to secure an additional 14-day extension. It is important to note the extension request must be made within 90 days of the original exam purchase date.

Once the candidate has submitted their completed examination, the UEB Online marking algorithm reviews the answers and calculates a final mark and grade. Successful candidates will receive a certificate of competency and feedback of errors made via their UEB Online dashboard. Unsuccessful candidates are offered the opportunity to resit the exam after 28 days have elapsed since their previous attempt. The 28-day waiting period is designed to provide time for reviewing mistakes and preparing for the exam resit. At the conclusion of the 28-day period, the candidate has 14 consecutive days to complete the chosen resit. Each candidate is offered a maximum of three resits of the exam, with different content presented in each exam. If unsuccessful in all attempts, the exam is closed, and the candidate must re-enrol in their chosen exam.

## Access modes

The UEB training programs and examinations are offered in three access modes: visual, high contrast, and non-visual mode. Visual Mode is intended for sighted subscribers with sufficient sight to access regular sized print. High contrast mode is for subscribers with low vision. In this mode, the font size, background colour and text colour may be personalised. Subscribers who select visual or high contrast mode will be shown the full print passage for translation into braille. On completion of each print to braille exercise, a full display of the braille representing the print passage is shown.

Non-Visual mode is intended for subscribers who use a screen reader. Passages to be translated from print to braille will first be read out one sentence or phrase at a time, and then word-by-word as each word is brailled from the passage. Subscribers may control the pace at which they proceed through the passage without losing track of their progress or being overwhelmed by the screen reader reading too much content at one time. The Screen Reader Help section of the UEB Online website includes information about additional screen reader commands that may be used in non-visual access mode.

Use of an electronic, refreshable braille display is an optional addition. However, the UEB team has found several intrinsic interoperability issues which limit the effectiveness of combining braille display and screen reader usage. One issue is that the braille display changes to always show the current word being completed in each exercise, rather than showing a group of words simultaneously.

## Technology requirements

Technology requirements are a PC or Mac computer with a Windows 10 or later operating system, standard keyboard, and an internet connection. New subscribers are required to complete an online keyboard check as not all computer keyboards allow for the simultaneous pressing of multiple keys, as is required for six-key entry of braille characters. Use of smart phones, iPads and other handheld touch devices is not an option due to limitations in simultaneously pressing letter combinations.

## Help and information

The resources section of the UEB Online website includes a wealth of open source information for all visitors to the website. The content includes UEB training manuals, formatting guidelines, braille definitions and references, video resources, cheat sheets, and useful links.

The Getting Started section of the website assists new and returning subscribers to the UEB training programs and competency examinations. An important feature is the “help” email address that connects subscribers directly with the NextSense UEB team. The inclusion of a screenshot in the email of the problem encountered will assist the team in identifying the issue and providing support in how to correct it.

Analysis of the help requests of subscribers has identified the following commonly occurring errors in the UEB literary and mathematics training courses (Gentle, Howse, Cashmore, 2021).

**Literary**:

* profoundness: the “of” contraction in this word is the most common error and the “ound” and the “ness” to a lesser extent
* behindhand: the “behind” shortform in this word is the most common error, with users often using the lower “b” for “be” then the “h” and the “in” contraction dh “and” contraction
* never-to-be-forgotten: this underlined sequence of text is commonly treated as 4 underlined hyphenated words using the typeform passage indicator and terminator rather than the typeform word indicator going against the typeform rule for hyphenated words
* MIEnvSc: the need to use the capital letter indicator in front of the “En” contraction in this sequence is the most common error missed even though there are similar examples in the lesson. Users do correctly use the capitalised word indicator at the start
* harry\_smith@braille2print.org: This has been a challenging example as it addresses a number of UEB rules. Firstly, contractions can generally be used in electronic addresses such as the “ar” in “harry” and the “th” in smith. Also, as wordsigns and shortforms are generally not used in electronic addresses the word “braille” would not be contracted. As the numeric indicator sets grade 1 mode for the remainder of the sequence, the “in” contraction in the word “print” would not be used when following the number 2. Similar examples are provided in the UEB Online Training course.

**Mathematics**:

* 4 minus 2 equals 2: the most common error in this and similar text type examples is the non-use of the “in” contraction in the word “minus” which should be contracted.
* X VI: The most common error in this example is putting a grade 1 indicator in front of the Roman numeral “X”. Due to the operation sign for the minus being unspaced, the “X” is not standing alone and so does not require the grade 1 indicator.
* : the most common error with this expression is the need to treat each fraction individually. That is, the need for the opening and closing general fraction indicators of the first fraction then the operation sign, then the opening and closing of the second general fraction.
* *dx*: The first 2 symbols in braille (the integral and the opening general fraction indicator) are the only ones that need a grade 1 indicator, so there is a tendency due to the length of the equation to place the sequence into grade 1 passage mode. There is a numeric indicator number 1 early in the sequence that sets grade 1 mode so grade 1 word mode at the start would be the preferred option. However, individual grade 1 symbol indicators are accepted in the programming as students producing their braille in class often use grade 1 symbol mode as they progress throughout the expression in their calculation.

Future projects

The NextSense UEB team is currently planning a structured series of online modules addressing the teaching of braille literacy to preschool and school-age children. The modules will consist of a series of “born accessible” pre-recorded presentations. Topics will include learning media and braille assessment, braille literacy programming and goal setting, teaching and learning strategies, and the developmental steps involved in braille literacy at emergent, early and advanced stages of reading and writing. The modules will include quizzes which are intended to assist with understanding of content.

## Conclusion

NextSense has communicated its commitment to innovation in the field of braille through development of fully accessible online training programs and competency examinations in Unified English Braille literary and mathematics. We believe that provision of open access at minimal or no cost has been instrumental in attracting around 36,000 registered subscribers from more than 150 countries to the braille offerings on the UEB Online website.

The positive impact of the braille programs has been recognised in Australia and internationally. In 2015, NextSense received an Australian National Disability Award for “excellence in accessibility”, an International E-Learning Award (IELA), Academic Division, and shortlisting for the Australia and New Zealand Internet Awards (ANZIA). In 2020, NextSense received a Zero Project Award for “innovative practice”. The Zero Project Awards are an initiative of the Essl Foundation, and the founding principle of the awards is to “create a world without barriers”.

NextSense is proud to support the World Blind Union, the International Council for Education of People with Visual Impairment, and the International Council on English Braille in their efforts to promote the right to braille for persons who are blind, in accordance with the United Nations [Convention on the Rights of Persons with Disabilities](https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html) (2006, Articles 2, 9, 21 and 24), the United Nations Sustainable Development Goals (2015), and the [Inclusive Education Report](https://www.internationaldisabilityalliance.org/ida-inclusive-education-2020) of the International Disability Alliance (2020, Section 2.2.1).

NextSense acknowledges, with deep appreciation, the many people who have contributed to the design and implementation of the programs. We express our gratitude to the sponsors who shared our belief that all children with blindness and low vision have the right to full and equal participation in education without discrimination and on the basis of equal opportunity.

## References

Gentle, F., Howse, J., & Cashmore, C. (2021, May). UEB Online: Did someone say “help”? Presentation at the virtual Conference of Round Table on Information Access for People with Print Disabilities Inc.

Howse, J., Gentle, F., Stobbs, K., Reynolds, J., Macanawai, S. & Steer, M. (2011, September), In the South Pacific: Efficiencies and opportunities through Braille code unification. Paper presented at the World Braille Congress*,* Leipzig, Germany.

International Disability Alliance. (2020). IDA Inclusive education report. <https://www.internationaldisabilityalliance.org/ida-inclusive-education-2020>

United Nations. (2006). Convention on the Rights of Persons with Disabilities. <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>

United Nations. (2015). Sustainable Development Goals: 17 Goals to transform our world. <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

World Blind Union and International Council for Education of People with Visual Impairment. (2016). WBU-ICEVI Joint position statement: Braille literacy. <https://icevi.org/other-publications/>