# International Council on English Braille

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## Title of Paper:

Unified English Braille (UEB) Training in Literary and Mathematics content using the UEB Online delivery model.

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## Background: UEB Online course development

Unified English Braille (UEB) was adopted for use in Australia by the Australian Braille Authority (ABA) in May 2005. The Unified English Braille Primer: Australian Edition, by Josie Howse, was published in 2006 and updated in 2008. This Primer was the original UEB teaching resource when Australia commenced implementing UEB in 2006. The Unified English Braille: Australian Training Manual was published in 2013 and updated in 2016, and was a revision of the 2008 UEB Primer. The 2013 and 2016 editions formed the basis of the UEB Online literary and mathematics training programs. The 2016 edition is currently under review due to recent decisions of the International Council on English Braille (ICEB), and the UEB Online training programs will be updated on a regular basis to encompass any relevant changes that occur.

The Royal Institute for Deaf and Blind Children (RIDBC) is a registered Australian charity. Established in 1860, RIDBC provides education and therapy services for children and adults with vision or hearing loss and their families. The RIDBC Renwick Centre for Research and Professional Education is administered by RIDBC and offers postgraduate degrees in disability and sensory impairment, in affiliation with Macquarie University and the University of Newcastle (NSW). Many of Renwick’s graduates take up positions as Teachers of the Deaf or Specialist Teachers (Vision Impairment). For those who become Specialist Teachers (VI), competency in UEB and braille literacy development is essential. Therefore RIDBC has offered braille training programs for many years as a core component of its masters’ degree program in vision impairment.

Historically, the RIDBC braille program was delivered as a series of weekly, on-campus lessons. This mode of delivery was extended over time to include distance learning for Renwick students who were unable to attend in person. The students would submit their completed braille exercises by post for marking and return. It was recognised that this labour-intensive model of program delivery, although rigorous, would become unsustainable over time and a more flexible, accessible and universal model was required.

In 2013, RIDBC established a UEB design team to investigate the feasibility of taking advantage of advances in accessible digital technology to develop online, self-paced and self-marking braille training programs. The research team communicated with several universities and organisations around the world that offered braille training programs. It was found that these training programs were similar to RIDBC’s braille programs, and involved the physical marking of completed braille exercises by a braille specialist. RIDBC made the decision to move forward with creating the first online UEB training program.

## Accessible inclusive digital technologies

After careful consideration of technology options for online lesson completion, the design team selected use of a standard PC or Mac computer with an internet connection. New subscribers visiting the UEB Online website are requested to create a profile and personal password, which enables them to work through the braille lessons at their own pace from any computer, saving their work as they go. Subscribers select from the visual and non-visual access options. Sighted subscribers may select regular or high contrast print; and subscribers with a vision impairment or print disability may select their preferred screen reader, or use a combination of screen reader and refreshable braille display.

Program development and testing resulted in the recommendation that a computer with a supported Windows operating system (Windows 10 or later) is optimal. Also optimal is use of a recent version of [Firefox](https://www.mozilla.org/firefox) by Mozilla (available as a free download) or a version of Internet Explorer (provided in the Windows operating system that is at least version 10 or above). Program testing has found that the JAWS screen reader works best with Internet Explorer and the NVDA screen reader works best with Mozilla Firefox. NVDA is available as a free download from NV Access and runs on Windows operating systems. A minimum of V2015.3 NVDA is recommended. At this stage the Microsoft Edge browser is not recommended.

UEB Online cannot be used with a handheld touch device running either the iOS (e.g. iPad) or Android (e.g. Samsung Galaxy) operating systems.

Every effort was taken during UEB Online development to ensure that a refreshable Braille display could be used as part of the learning process. However there are a number of intrinsic interoperability issues which mean the use is less than optimal. An example of this is that as each word is being read out during exercise data entry, the braille display is changed to reflect the current word being read. This means all previous content on the display is lost. As a result, UEB Online is unable to produce a group of words simultaneously on the Braille display. Instead UEB Online focuses on ensuring that the current word being typed is reflected on the Braille display so that each word can be felt, rather than a sentence or group of words. For this reason, the UEB Online design team suggest the use of a refreshable Braille display as an **optional** tool for learning only, rather than the primary mode of lesson completion. During development and testing, the [Focus 40 Blue](http://www.freedomscientific.com/Products/Blindness/Focus40BrailleDisplay) from Freedom Scientific was used.

During the development phase, a digital braille cell was created, consisting of six keys on the standard computer keyboard (that is, keys s,d,f and j,k,l). These keys represent the six dots of the braille cell and enable subscribers to learn about traditional braille writing methods. The print-to-braille and braille-to-print exercises involve the pressing of different combinations of the six keys on the keyboard to create the various braille letters, numbers and words. Before starting the lessons, new subscribers are required to complete an online keyboard check, as not all computer keyboards allow for the simultaneous pressing of multiple keys.

Subscribers receive instant feedback when an error is made during exercise completion, and must correct each error before they can continue. In this way, each subscriber progressively builds his or her braille knowledge and mastery of content.

## UEB Online programs

At the present time, the braille training programs available on the UEB Online website consist of the following:

* Literacy: Modules 1 and 2
* Mathematics: Introductory (primary school level) and Advanced (junior secondary school level)

The recommended UEB Online study sequence is: (i) completion of UEB Literacy modules 1 and 2; followed by (ii) UEB Introductory Mathematics; and then (iii) UEB Advanced Mathematics and (iv) UEB Extension Mathematics. This is because Unified English Braille is a single code system that encompasses the braille symbols for literary and technical information. It is important, therefore, to be knowledgeable of the UEB symbols used in literary contexts, as these symbols are used for literary content of mathematical information.

The UEB design team is currently working on a third braille mathematics program called UEB Extension Mathematics, with the release date of mid-2020. This program will address mathematics content that is encountered during the senior years of secondary school.

## UEB Online Literary Modules 1 and 2

The two UEB literary modules are based upon the UEB Australian Training Manual (Howse, Reissen and Holloway, 2013; 2016). Module 1 consists of lessons 1 – 14 and Module 2 of Lessons 15 – 30. Each Lesson has an explanation of what sign is being introduced with examples. Punctuation is introduced gradually from Lesson 1 onwards. Following each lesson explanation there is a Practice Exercise and an Extra Practice Exercise to complete and each must be brailled line for line. The Practice and Extra Practice exercises for Lessons from 1 – 22 have been cleverly devised to all finish exactly in cell 40 of each line (i.e., right adjustment). Lesson 22 completes the learning of contractions while lessons 23 – 30 introduce other UEB signs required in braille transcription and their rules of use. Following Lesson 22, there is no right adjustment on each line. In lessons 23 to 30, the braille follows normal wrap-around text style with basic formatting, requiring new paragraphs to be placed in cell 3.

The programming has been designed to ensure that a subscriber is alerted if an error has been made and then subsequently cannot proceed until the error has been corrected. The Exercise and Extra Practice exercises are each saved progressively and the subscriber can progressively move through the lessons.

## UEB Online Mathematics

The aims of the UEB Introductory and Advanced Mathematics training programs are to enable professionals and parents/caregivers to:

* To promote the acquisition of knowledge of Unified English Braille as it is applied to the continuum of those mathematical symbols that are typically taught during the primary and secondary years of schooling; and
* To raise awareness of the enormous potential of braille knowledge and skills in enabling students with vision impairment to effectively access and engage with mathematics content and to communicate their mathematical understanding in a broad range of contexts.

The introductory and advanced mathematics programs are presented as a series of lessons that address specific topics in primary level mathematics. The wording of the mathematical rules presented in the lessons is drawn from the ICEB guidelines for technical material (2014).The lessons include practice and review exercises involving print to braille transcription. The lessons build on each other, enabling progressive consolidation and mastery of content.

## UEB Online Introductory MathematicsProgram: Content

Lessons 1 – 8 of the introductory mathematics program each consist of a lesson explanation with examples, an exercise testing the understanding of the content that has been introduced in that lesson, and a review exercise that encompasses everything that has been covered in all lessons up to that point. There are no new rules or concepts in any of the exercises that have not already been explained in that lessor or preceding lessons.

The content of the introductory mathematics program is as follows:

* Lesson 1: Introducing numbers and numeric mode
* Lesson 2: Operation and comparison signs
* Lesson 3: Grade 1 mode
* Lesson 4: Special print symbols
* Lesson 5: Omission marks
* Lesson 6: Shape indicators
* Lesson 7: Roman numerals
* Lesson 8: Fractions (Simple, mixed numbers and linear fractions)
* Lesson 9: Review test, lessons 1 to 8
* Lesson 10: Introductory mathematics test

## UEB Online Advanced Mathematics Program: Content

The program and accompanying training manual follows the same structure as the Introductory Mathematics, whereby Lessons 1 – 8 comprise a lesson explanation with examples, an exercise testing the understanding of the content that has been introduced in that lesson, and a review exercise that encompasses everything that has been covered in all lessons up to that point. As with the introductory program, there are no new rules or concepts in any of the exercises that have not already been explained. There is a strong component of revision to ensure the major principals of Unified English Braille (UEB) are clearly understood.

The content of the advanced mathematics program is as follows:

* Lesson 1: Grade 1 mode (symbol) revised and Algebra
* Lesson 2: Grade 1 mode (word and passage) and General Fractions
* Lesson 3: Operation and comparison signs (continued)
* Lesson 4: Indices
* Lesson 5: Roots and other radicals
* Lesson 6: Shape indicators (continued) and Miscellaneous symbols
* Lesson 7: Functions
* Lesson 8: Greek letters
* Lesson 9: Review test, lessons 1 to 8
* Lesson 10: Advanced mathematics test

## Support for subscribers

The UEB Online website includes a “help” email address that connects subscribers directly with the design team. Subscribers experiencing difficulties with exercise completion are asked to attach a screen shot of the error message so that the support team can understand the nature of the problem. The website also includes a wealth of online resources and common questions and answers.

## Impact of UEB Online

RIDBC made the decision at the outset to offer its online braille courses free of charge, with an optional administration fee of AU$50.00 for a certificate of completion. Online delivery, combined with visual and non-visual access modes and a zero cost, has opened up theonline training programs to anyone who wishes to learn braille, regardless of their geographical location or financial status.

The global uptake of the UEB Online braille training programs has been quite extraordinary. Since the launch of UEB Online in June 2014 to January 2020, there have been 18,292 subscribers from 197 countries. These subscribers completed 672,427 online sessions. Considering English is not the first language in many of the 197 countries, the design team assumes that UEB Online is being used to support English teaching programs in schools and workplaces for persons who are blind.

Listed below are the sessions completed by the current members of ICEB and the relative percentage of the total number of sessions completed:

Total sessions completed: 672,427 (100%)

* USA 324,095 (48%)
* United Kingdom 176,027 (26%)
* Australia 76,518 (11.4%)
* Canada 30,055 (4.5%)
* New Zealand 12,041 (1.79%)
* Ireland 3,503 (0.52%)
* South Africa 1,136 (0.17%)
* Nigeria 523 (0.08%)
* Other 48,529 (7.22%)

RIDBC is proud to have contributed to addressing the following three global challenges that were identified by the World Blind Union (2019):

* The chronic shortage of teachers qualified to teach braille;
* Braille not included in teacher training programs or offered by education systems in many countries; and
* The high cost of braille equipment, especially in low income countries.

The positive impact of UEB online was recognised by the World Braille Council in 2018. The World Braille Council passed a resolution promoting development of similar online braille training programs for other languages. The RIDBC design team look forward to future collaboration with the World Braille Council and any countries that wish to explore online braille options.

## Acknowledgements

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The content author and design team would also like to extend their appreciation to the International Council on English Braille (ICEB) and the Australian Braille Authority (ABA) for the availability of the Unified English Braille (UEB) publications without which the content of these successful, innovative, online training modules would not have been possible.

## Conclusion

In conclusion, we hope that this contribution to the disability field will provide professionals and parents with the required knowledge to support and encourage secondary school students with vision impairment to actively and confidently engage with learning.

We wish to advise the ICEB delegates and observers that recently Josie Howse was honoured to represent the Royal Institute for Deaf and Blind Children at the Zero Project Conference in Vienna where, following a tough, multi-stage process, the nomination of UEB Online was selected as an *Innovative Practice of the Zero Project 2020.* This award was presented at the United Nations in Vienna, in February 2020, in front of experts and leaders in the field of disability from around the world. The Zero Project is an initiative of the Essl Foundation, which focusses on the rights of persons with disabilities globally. International recognition of the value and importance of the UEB Online training programs was an exciting and prestigious acknowledgement.

## References

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