Technical Framework: UEB Braille Transition
Version 1.1: 31 July 2020

Education for students who are blind and visually impaired in the United States is transitioning from English Braille, American Edition (EBAE) code to Unified English Braille (UEB) code. During the transition, Smarter Balanced will accommodate students with a preference for EBAE, UEB, or a combination of codes to account for the student's progress and changing needs.

Braille text may include contractions, which combine multiple letters or single words into fewer characters. Students who are first learning braille may need uncontracted braille while more advanced students may prefer contracted braille.

In the United States there are also two options for braille math code. UEB includes one method for encoding numerals and mathematical symbols but Nemeth code is also widely used. At this time, the Braille Authority of North America has provided guidelines for incorporating both codes – UEB math notation and Nemeth notation while using UEB for all other text. Accordingly, Smarter Balanced will let students select their preferred math code.

These three binary options (EBAE or UEB, Uncontracted or Contracted, and UEB Math or Nemeth Math) result in eight possible braille combinations during the transition period. In practice, however, UEB math codes are not used with EBAE text and there are many texts (principally in ELA/Literacy) that do not use math codes of any sort. Including no-math options and eliminating unused combinations results in six possible student preferences and 10 possible braille encodings as detailed later in this document. The Smarter Balanced solution within test packages will support all of these options. Smarter Balanced expects to delivery tests supporting all options for the 2018-2019 school year. Hard copy (embossed) tests with UEB will be available for the 2017-2018 school year.

Braille Content

Many Smarter Balanced assessment items include braille files to be embossed on paper for students reading braille. Please see the [Usability, Accessibility and Accommodations Guidelines (UAAG)](.)[1] for detailed descriptions and policies regarding accessibility features including braille.

Most of the braille files are in industry-standard Braille Ready Format (.BRF)[2]. Certain items, principally those used in the math exams, require tactile graphics. These items are in .PRN format which can include braille text and tactile graphics. The format is specific to the ViewPlus Tiger Embosser but may also be supported by other graphic embossers.

---

[1] Usability Accessibility and Accommodations Guidelines (UAAG): http://www.smarterbalanced.org/wp-content/uploads/2015/09/Usability-Accessibility-Accomodations-Guidelines.pdf

[2] Braille Ready Format: https://www.bookshare.org/cms/help-center/training-and-resources/braille

The braille options are expressed using a three-letter code according to Table 1:

Letter[3]			Meaning
E			EBAE
U			UEB
	X		Uncontracted
	C		Contracted
		N	Nemeth Math Code
		T	UEB Math Code
		L	No Math Code Needed

Table 1: Letters assigned to braille forms.

This results in twelve three-letter codes indicating the form of braille in a particular embossing file as shown in Table 2.

Braille Form Code	Standard	Contracted	Math	Comment
EXN	EBAE	Uncontracted	Nemeth Math Code	
EXT	EBAE	Uncontracted	UEB Math Code	Not a valid combination.
EXL	EBAE	Uncontracted	No Math Code Needed	
ECN	EBAE	Contracted	Nemeth Math Code	
ECT	EBAE	Contracted	UEB Math Code	Not a valid combination.
ECL	EBAE	Contracted	No Math Code Needed	
UXN	UEB	Uncontracted	Nemeth Math Code	
UXT	UEB	Uncontracted	UEB Math Code	
UXL	UEB	Uncontracted	No Math Code Needed	
UCN	UEB	Contracted	Nemeth Math Code	
UCT	UEB	Contracted	UEB Math Code	
UCL	UEB	Contracted	No Math Code Needed	

Table 2: Three letter codes for braille content.

An assessment item that includes math content may have six braille embossing files encompassing all six options that include math codes. An item without math content would have four embossing files, all with the "No Math Code Needed" option. In most cases, ELA items will not have math content. However, English Literacy includes reading scientific and technical documents so there may be ELA items that still include mathematical content and include six options.

Future items developed by Smarter Balanced may exclusively support UEB. In that case they will have four embossing files for math and two when no math code is needed.

---

[3] The letter "T" is assigned to UEB Math Code because it is derived from the Taylor Code. "L" is used for No Math Code because it makes use of the literary numeral codes in EBAE and UEB.

SmarterBalanced.org

Table 3 summarizes the braille files that will be included for each item class in the 2018-2019 online test package and subsequent releases:

Item Class	Braille embossing forms included.
Item supporting EBAE and UEB with math content.	EXN, ECN, UXN, UXT, UCN, UCT (6 forms)
Item supporting EBAE and UEB without math content.	EXL, ECL, UXL, UCL (4 forms)
New item, exclusively UEB with math content.	UXN, UXT, UCN, UCT (4 forms)
New item, exclusively UEB without math content.	UXL, UCL (2 forms)

Table 3: Braille embossing file types included in UEB enabled items.

Existing Braille Support

Beginning with the first test administration in 2014-2015 school year, Smarter Balanced provided EBAE braille files for English Language Arts (ELA) in both contracted and uncontracted forms. For Math items, Smarter Balanced provided files in contracted EBAE format using Nemeth math notation.

Table 4 indicates the existing braille form designations and the equivalent new forms.

Item Subject	Existing braille form designation	Equivalent new braille form designation
ELA	uncontracted	EXL
ELA	contracted	ECL
Math	nemeth	ECN

Table 4: Existing embossing file types used in items prior to UEB enhancement.

ISAAP Braille Codes

The Individual Student Assessment Accessibility Profile (ISAAP) indicates which accessibility features should be made available to a particular student. There is an ISAAP code for each accessibility option. Smarter Balanced has defined six new ISAAP codes to indicate the student's braille preference. A seventh code indicates no braille. Please see the current version of ISAAP Accessibility Feature Codes[4] on SmarterApp.org for the official specification for all ISAAP codes.

The ISAAP braille codes in Table 5 use the same letter conventions as described for content in Table 1 and Table 2. The "No Math Code Needed" options are not included because students must always select a math code preference regardless of subject. The TDS_BT0 "No Braille" option is the default and is used for sighted students that do not require a braille accommodation.

Feature Code	Standard	Contracted	Math
TDS_BT0	No Braille		
TDS_BT_EXN	EBAE	Uncontracted	Nemeth Math
TDS_BT_ECN	EBAE	Contracted	Nemeth Math
TDS_BT_UXN	UEB	Uncontracted	Nemeth Math
TDS_BT_UXT	UEB	Uncontracted	UEB Math
TDS_BT_UCN	UEB	Contracted	Nemeth Math
TDS_BT_UCT	UEB	Contracted	UEB Math

Table 5: ISAAP codes express a student's braille need and preference.

---

[4] SmarterApp ISAAP Accessibility Feature Codes Specification: http://www.smarterapp.org/specs/ISAAP-AccessibilityFeatureCodes.html

SmarterBalanced.org

Existing ISAAP Braille Codes

There are three existing ISAAP braille codes indicating Contracted, Uncontracted, and Nemeth (contracted). These will be phased out in favor of the new codes. Table 6 lists the existing ISAAP Braille Codes and how they map to the new codes.

Existing Code	New Code	Original Meaning
TDS_BT0	TDS_BT0 (unchanged)	No Braille
TDS_BT_G1	TDS_BT_EXN	Uncontracted EBAE
TDS_BT_G2	TDS_BT_ECN	Contracted EBAE
TDS_BT_NM	TDS_BT_ECN	EBAE with Nemeth Math

Table 6: Existing ISAAP braille codes mapped to the new codes.

Braille Transcripts of Closed Captions

Students with both visual and hearing disabilities may benefit from a braille transcript of the closed captions associated with a listening passage. Braille transcripts are enabled by a combination of two ISAAP codes. When both a braille option (such as TDS_BT_UCN) and Closed Captioning (TDS_ClosedCap1) are designated, the expectation is that a test delivery system will allow embossing of the braille transcript.

Items supporting braille transcripts have two types of embossing files. The regular embossing file is the stimulus text. Typically, this is a short introduction such as "Listen to the recorded passage and answer the associated questions." In addition, there is a transcript embossing file which contains a transcript of the audio recording.

Naming Convention for Braille Embossing Files

A consistent naming convention for braille embossing files ensures that we know the item or stimulus to which a file belongs, the braille form (EBAE/UEB, uncontracted/contracted, Nemeth/UEB Math) the language (always English) and the braille embossing format (BRF or PRN).

The convention follows this pattern:

<item or stim>_<item ID>_<language>_<braille form>.<format>

Transcript files follow the same pattern except that "_transcript" is inserted after the braille form and before the format extension.

Here are definitions of each field:

- **Item or stim:** Either "item" or "stim" indicating whether this file corresponds to an item or a stimulus.
- **Item ID:** The ID of the item to which the file corresponds.
- **Language:** A language identifier. For Smarter Balanced braille files this is always "enu" indicating English-US
- **Braille Form:** One of the three-letter codes from Table 2. For legacy items this is "contracted", "uncontracted" or "nemeth" interpreted according to Table 4.
- **Format:** Either ".brf" for a Braille Ready File or ".prn" for a braille file in ViewPlus format that incorporates tactile graphics.

Examples:

Name	Type	Item ID	Language	Form	Format
item_20551_enu_ecl.brf	Item	20551	English US	EBAE, Contracted, No Math	Braille Ready Format

SmarterBalanced.org

stim_8393_enu_ucn.brf	Stimulus	8393	English US	UEB, Contracted, Nemeth	Braille Ready Format
stim_8393_enu_ucn_transcript.brf	Stimulus	8393	English US	UEB, Contracted, Nemeth, Transcript	Braille Ready Format
item_4295_enu_uxt.prn	Item	4295	English US	UEB, Uncontracted, UEB Math	ViewPlus
item_23843_enu_ect.brf	Item	23843	English US	EBAE Contracted, UEB Math	Braille Ready Format
item_23843_enu_ect_transcript.brf	Item	23843	English US	EBAE Contracted, UEB Math, Transcript	Braille Ready Format
Item_923_enu_uxl.prn	Item	923	English US	UEB, Uncontracted, Nemeth	ViewPlus

Locating Braille Embossing Files in Test Package Items and Stimuli

Smarter Balanced test items are packaged together in a test content package according to the SmarterApp Item Packaging Specification[5]. Each item is a set of files in a folder according to the SmarterApp Assessment Item Format (SAAIF)[6]. Braille embossing files are included in the folder and referenced by the item .xml file as attachments.

Here is an example of an attachment section from an assessment item:

```
<attachmentlist>
   <attachment id="braillefile1" type="BRF" file="item_20551_enu_uxl.brf "
     subtype="uxl"/>
   <attachment id="braillefile2" type="BRF" file="item_20551_enu_ucl.brf"
     subtype="ucl"/>
   <attachment id="transcript1" type="BRF" file="item_20551_enu_uxl.brf "
     subtype="uxl_transcript"/>
   <attachment id="transcript2" type="BRF" file="item_20551_enu_ucl.brf"
     subtype="ucl_transcript"/>
</attachmentlist>
```

The attachment attributes should be interpreted as follows:

- **id:** A unique identifier.
- **type:** The type of the attachment. For braille this should either be "BRF" for Braille Ready Format or "PRN" for a braille file that includes tactile graphics in ViewPlus format.
- **file:** The filename of the attachment file. It should be located in the same folder as the item.

---

[5] SmarterApp Item Packaging Specification: http://www.smarterapp.org/specs/SmarterApp_ItemPackaging.html
[6] SmarterApp Assessment Item Format: http://www.smarterapp.org/specs/AssessmentItemFormat.html

SmarterBalanced.org

- **subtype:** The braille form code. For new or updated test items this is one of the 12 values in Table 2. For legacy test items this is one of the 3 values in Table 4. For braille transcripts, the three-letter code is followed by "_transcript".