Nemeth or UEB: Factors and Considerations for Math Code

The intent of this document is to assist the Teacher of Students Who Are Blind or Have Low Vision (TBLV) by providing factors to be considered and discussed by the CCC for determining and recommending the most appropriate braille code for instruction of subjects that require math per the student's IEP.

UEB is one code for literary, mathematics, and computer science text elements. The UEB technical code for math and science is part of the UEB and is used in all grade levels; therefore the use of the term UEB implies a complete code that includes math. *UEB with Nemeth Code* includes the Nemeth Code used within UEB context for math and technical materials.

As a default, requests for instructional materials in subjects that require math (i.e., science and mathematics), for all grades, will be produced in UEB with Nemeth Code for mathematics, as specified in the *UEB Transition and Implementation in Indiana, Indiana Educational Resource Center/ICAM Position Statement for the Provision of Materials.* UEB will be provided in lieu of Nemeth Code only if the student's IEP dictates UEB for math instruction. The Case Conference Committee (CCC) must determine if UEB better meets the instructional needs of the student.

When it is determined that braille is a consideration for the student who is blind, then the code (Nemeth or UEB) for the instruction of subjects that require math will need to be specified and a written justification provided.

Current research, surrounding the use of UEB, to justify academic decisions, is limited as UEB is relatively new to the United States and other adopting countries. The factors outlined in this document should be considered until the results of future research prove otherwise.

Factors:

1. Instruction

- The student's previous instruction in the area of mathematics.
- The student's current familiarity with mathematic symbols (UEB and/or Nemeth math code).
- The student's ongoing instruction in code introduction.

Considerations	
UEB	Nemeth
• The math symbols used in UEB (e.g., plus, equals, parentheses, dollar sign) are the same in both literary and mathematics text, thus, eliminating the need for separate code instruction in mathematics. • A student who has demonstrated confusion in symbol ambiguity (i.e., two separate braille symbols representing one print symbol depending on context) may benefit from instruction in UEB.	• A student who has begun mathematics instruction using Nemeth Code will most likely benefit from the continued use of Nemeth to complete mathematics courses throughout the remainder of his or her school years. • A student who demonstrates no confusion in symbol ambiguity (i.e., two separate braille symbols representing one print symbol depending on context) may benefit from math instruction in Nemeth Code.

2. Eye Conditions, Prognosis, and Age of Onset

- The child's eye condition including prognosis and stability.
- The age of onset of the child's visual impairment.
- Transition from visual mathematics to tactual mathematics.

<table>
<tr><th colspan="2">Considerations</th></tr>
<tr><td colspan="2">Currently, there is no research that suggests a preference for Nemeth or UEB depending on a student's eye condition, prognosis or stability; however, the determination of braille as a consideration is dependent upon these factors. The age of onset of the student's visual impairment will have an impact on this decision in relation to the student's previous instruction and level of mathematics concept acquisition as well as the challenges with instruction in core and expanded core curriculum areas given a new vision loss.</td></tr>
<tr><td>UEB</td><td>Nemeth</td></tr>
<tr><td>• A student, who is transitioning from visual to tactual math and who has worked in visual mathematics and is accustomed to a single symbol being used in literary and mathematics textbooks, may prefer UEB, as UEB more closely follows print.</td><td>• A student, who is transitioning from visual to tactual math, may prefer Nemeth, because of its streamlined nature requiring fewer cells, thus its ability to convey math concepts in a concise and efficient manner.</td></tr>
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3. Cognitive Ability

- The student's current academic skills.
- The student's mathematics ability including achievement in mathematics concepts.
- The student's ability to think critically.
- The supports needed for the child to acquire and process new skills and learn braille symbols in a variety of contexts (literary material, mathematics, science).

<table>
<tr><th colspan="2">Considerations</th></tr>
<tr><td colspan="2">Currently, there is no research to support that a student’s cognitive ability has an impact on the code that he or she will use to access mathematics or other technical materials.</td></tr>
<tr><td>UEB</td><td>Nemeth</td></tr>
<tr><td>• A student who would benefit from the simplicity of braille symbols that are used across subject matter texts may benefit from UEB.
• A student who routinely encounters math symbols in UEB, may benefit from math instruction in UEB if instructional strategies can be provided that infuse math symbols in literary reading materials.</td><td>• A student who does not require the simplicity of braille symbols that are used across subject matter texts may benefit from Nemeth Code.
• A student may benefit from math instruction in the Nemeth Code if instruction can be provided in both the code and math concepts simultaneously.</td></tr>
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4. Interests and Aptitude

- The student's interest in STEM (**S**cience-**T**echnology-**E**ngineering-**M**athematics) fields.
- The student's aptitude in STEM subjects.
- The student's future aspirations regarding post-secondary education and career.

Considerations	
Research (Holbrook & MacCuspie, 2010; Cryer, Home, & Morley Wilkins, 2013) and anecdotal evidence from other English-speaking countries using UEB suggests that the code used for representing materials in technical fields (UEB, Nemeth or British Maths) is less important than instruction in subject matter concepts.	
UEB	Nemeth
• A student with high interest in STEM subjects may benefit from the use of UEB if the educational team determines that the consistency of using a single symbol for print symbols across subject texts would support building foundational STEM concepts.	• A student who is interested in higher level STEM subjects may benefit from Nemeth instruction given the traditional use of Nemeth in these areas and the availability of new and classic texts which have already been translated into Nemeth. • Nemeth is a more streamlined code that requires fewer cells which will have an impact on writing mathematics and thus, might be a good choice for students with interest and aptitude in STEM.

5. Braille Skills

- Reading level using literary braille (below, at or above grade level), including comprehension and fluency.
- Student is able to produce/create braille documents at grade level.
- Ability to use technology to produce backwards and forwards translated materials (i.e., print to braille and braille to print).

Considerations	
UEB	Nemeth
• UEB is more easily translated to and from print because it is more closely aligned with print and has fewer instances of ambiguity (one symbol standing for more than one print symbol depending on context). For this reason, students who are adept at using technology for accessibility between print and braille may find UEB helpful. • Guidelines for the formatting of UEB technical math have fewer and less specific rules than those provided for the Nemeth Code. In some instances, the UEB guidelines allow for more than one way to display technical material.	• Currently, more Nemeth materials are available and thus students will have greater access to a wide variety of materials. • Writing Nemeth requires fewer cells and thus students may be able to produce written math work faster. • Nemeth Code has comprehensive and specific guidelines for transcription and formatting of technical material, that when followed, provides for a consistent presentation of braille material.

6. Other

- Student's ability to transition from activity to activity (task to task).
- Student's level of intrinsic motivation in learning braille.
- Student's level of frustration and anxiety in the current code.
- Student's need for additional time to complete academic tasks.

<table>
<tr><th colspan="2">Considerations</th></tr>
<tr><td colspan="2">Students' attitudes and motivations (and the attitudes and motivations of their parents) is important to consider when making all educational decisions. While some students appear to have intrinsic motivation or frustration and anxiety in learning the braille code, it should be noted that a student's feelings of the braille code is very difficult to separate from their motivation, frustration or anxiety in learning the content that is represented by the braille symbols. Therefore, motivation, frustration and anxiety should be carefully examined in relation to both the braille code being used and the content of the text/subject matter being learned.</td></tr>
<tr><td>UEB</td><td>Nemeth</td></tr>
<tr><td>A student's ability to transition from activity to activity (task to task) may find UEB helpful, as the transition from reading literary text to mathematics text would not necessitate a transition in codes (symbols), but rather a transition in conceptual content.
Students who are frustrated and anxious by the multiple uses of a single braille symbol may find that use of UEB in mathematics can alleviate their concerns.
Students who require additional time for completion of academic tasks may find that technology support for UEB in forward and backward translation can help save time.</td><td>A student who is able to transition easily from activity to activity (task to task) may find that the transition to different symbols is not disruptive to his or her learning of conceptual content.
Students who are frustrated and anxious by the number of cells required to represent math texts may find Nemeth useful since it uses fewer symbols and is more compact.</td></tr>
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References:

Cryer, H., Home, S., & Morley Wilkins, S. (2013). Unified English Braille in the United Kingdom: Part 1—Examination by technical expert braille users. *British Journal of Visual Impairment*, 31, 228–237.

Holbrook, M. C., & MacCuspie, P. A. (2010). The Unified English Braille code: Examination by science, mathematics, and computer science technical expert braille readers. *Journal of Visual Impairment & Blindness*, 104, 533–541.