

## Slide 1: Building Braille Readers STEM and Graphics Literacy Skills Through Project INSPIRE's Activities for Students and Professionals

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Image caption: Project INSPIRE logo

## Slide 2: Project INSPIRE: Increasing the STEM Potential of Individuals Who Read Braille

- U.S. Department of Education grant funded project
- October 1, 2019 through September 30, 2024
- We provide:
  - Professional development for teachers of students with visual impairments, paraprofessionals, and transcribers
  - Extra-curricular programming supporting the use of STEM braille codes by students in both math and science
- Years 1-3: Nemeth Code
- Years 4-5: UEB Technical

## Slide 3: Seven Professional Development Courses

- Self-paced online, free courses  
<https://www.pathstoliteracy.org/resource/project-inspire/>
- Each course is offered 2 times in a 5-6 week period before being made available on Paths to Literacy.
  - Pre and posttest data collected
  - Post-survey data collected
- Courses include Nemeth Code or UEB Math/Science lessons as well as lessons focused on methods and materials used in STEM instruction of braille learners.

## Slide 4: Courses 1-7 Topics

- **Course 1:** Nemeth Code within UEB Contexts and Strategies for Supporting the PreK-1<sup>st</sup> Grade Student in Building Math Skills
- **Course 2:** An Introduction to Nemeth Code Symbols Used in Grades 2 to 5 and Strategies for Supporting Elementary Students in Building Math Skills
- **Course 3:** Grades 2 to 5: Nemeth Code Symbols for Fractions and Spatial Problems, Instructional Tools, Materials and Technology

## Slide 5: Course 1-7 Topics, Continued

- **Course 4:** Geometry and Tactile Graphics for Students in Grades 3 to 8
- **Course 5:** Nemeth Code Symbols Used in the Middle Grades and Strategies for Supporting Math Learning
- **Course 6:** Nemeth Code Symbols Used in High School and Strategies for Supporting STEM Learning
- \***Course 7:** An Introduction to UEB Math/Science fore Pre-Kindergarten – First Grade Students and Strategies for Supporting Math Learning

\*Course being field tested and/or developed and not yet available for general use.

## Slide 6: Each Course Contains

- Course objectives
- Six/Seven lessons
- 1-2 assignments
- Resource list

All material is provided in PDF and BRF formats.

Image caption: Grades 2-5: Nemeth Code Symbols for Fractions and Spatial Problems, Instructional Tools, Materials, and Technology (Course 3) home page

## Slide 7: Course Components

- Video
- Transcript (PDF)
- Activities (PDF & BRF)
- PowerPoint (PDF)

A BRF of the PowerPoint is under "If You Are a Braille Reader."

Image caption: Lesson 3: Grouping Symbols and Superscripts page

## Slide 8: Let's Watch Part of Lesson 3

A video will be played by the presenter.

## Slide 9: Course 4: Lesson 5

Examples provided throughout the lesson to demonstrate how to support students in math class.

Image caption: Lesson 5: Teaching Your Students to Create Their Own Drawings page

## Slide 10: Let's Watch Part of Lesson 5

A video will be played by the presenter.

## Slide 11: Assignments

- **Assignment 1:** Opportunity to prepare math materials using Nemeth Code content taught in course
- **Assignment 2:** Opportunity to apply concepts learned about supporting students building math skills
  - Course 6 does not have Assignment 2.

Image caption: Course 2 Assignments page

## Slide 12: Course 2: Assignment 1

Image caption: Math Test Review 1 worksheet in print

Image caption: Math Test Review 1 answer key in SimBraille, page 1

## Slide 13: Course 3: Assignment 2

Pick one of the two scenarios below. Describe what you would do to ensure the child's success. If there are materials you will provide that are commercially available or already made, provide links or insert information into your response.

## Slide 14: Scenario 1

Haro is a 3rd grader at Manchester Elementary School. He has strong braille skills and uses Nemeth Code within UEB context. He is learning about fractions in his math class. Next week, Haro will participate in an Orientation & Mobility (O&M) lesson at his local convenience store. He will be purchasing up to \$2.00 worth of products. These will be shared with others in order to reinforce the concept of fractional parts. He will be walking from his home to the store 3 blocks away, accompanied by his O&M specialist, Mr. York. You have had successful collaborative lessons with Mr. York in the past.

1. What information can you share with Mr. York about the math concepts, including about fractions and money, that could be embedded in this lesson?
2. What math related materials or tools would you recommend Haro bring with him?
3. What would your pre-teaching prior to the lesson look like? What would you do for a follow-up? Keep the following in mind: math concepts, using Nemeth within UEB, and math tools to assist.

### Slide 15: Example Answers for Question 1

What information can you share with Mr. York about the math concepts, including about fractions and money that could be embedded in this lesson?

- The item at the store to purchase, such as a muffin or cookie, can be split into a fraction- like I will eat  $\frac{1}{2}$  and you can eat  $\frac{1}{2}$ .
- Money can be split into parts ( $\frac{1}{4}$  = quarter,  $\frac{1}{10}$  = dime, dollar is a whole, etc.). They could practice preparing his money for the trip, as it is important to organize and plan ahead of time (how to fold bills, differentiate coins, etc.).
- Mr. York could point out that his folding cane is separated into parts which can be represented by a fraction (an open cane is 3 parts joined together to make a whole  $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1$  whole).

### Slide 16: Is Project INSPIRE Having a Positive Impact on Professionals Supporting Braille Readers in STEM?

### Slide 17: Individuals Reached: Spring 2020 – Spring 2023 Courses

**452** individuals have completed one or more courses!

- 334 (54%) have completed 1 course
- 82 (27%) have completed 2 courses
- 25 (12%) have completed 3 courses
- 8 (5%) have completed 4 courses
- 3 (2%) has completed all 5 courses!

Professional role

- 284 TVIs (63%)
- 96 Transcribers/braillists (22%)
- 70 Paraprofessionals (15%)

## Slide 18: Reminder on Courses

- **Course 1:** PreK-1<sup>st</sup> Grade Students
- **Course 2:** Grades 2 to 5 Introduction
- **Course 3:** Grades 2 to 5 Fractions and Spatial Problems
- **Course 4:** Grades 3 to 8 Geometry and Tactile Graphics
- **Course 5:** Middle Grades

## Slide 19: Who Has Taken the First Five Project INSPIRE Courses?

### **620 Completers**

- Course 1: 152 completers
- Course 2: 139 completers
- Course 3: 100 completers
- Course 4: 116 completers
- Course 5: 113 completers

### **Pre-Post Test Scores Across Courses**

- Average pre-test score 11 out of 20 points or 55%
- Average post-test score 17 out of 20 points or 85.0%
- Overall average difference 6 points or 30%

## Slide 20: Why Do 46% of People Take 2 or More Courses?

"I took the courses because I knew that I would be needing to use Nemeth in UEB Contexts and wanted to improve my rusty skills. I found the classes interesting, informative, and at times challenging despite my previous experiences teaching the symbols, formatting, etc... covered in the courses. I liked the quick responses to questions and the lack of judgment on the part of the instructors to those questions. I have Paths to Literacy bookmarked and the courses have been opened multiple times and shared with others who had questions. I recommend the courses to anyone who needs to teach Nemeth. You might not need the knowledge today but the next student walking into your district could be where they will need it."

Sandra, TVI, who completed 4 courses

## Slide 21: We Appreciate That Our Courses are Valued

"I love these courses and that Project INSPIRE can give educators these resources and share their knowledge free of charge. All students should be set where they can succeed in and outside of the classroom to be better prepared for the future. Project INSPIRE gives educators the tools to get one step closer to that goal!" (Course 2)

"Just a mighty 'THANK YOU' for this ongoing support to invest in quality materials for students who are blind and visually impaired. Teachers, parents and students are all benefitting from these organized classes with straightforward, long lasting resources. A thousand thank you's are not enough!" (Course 4)

## Slide 22: Nemeth in a Box for Middle School Students

- Activities to teach Nemeth Code symbols in mathematical context through puzzles and games that challenge students and build their reasoning skills.
- Offered via Zoom 4 times in six 90-minute sessions
- All materials are online

<https://www.pathstoliteracy.org/nemeth-box-middle-school-students>

Image caption: A girl reading Nemeth symbols on a braille page.

## Slide 23: Purpose of Nemeth in a Box

- GOAL: Teach Nemeth Code symbols in mathematical context through puzzles and games that challenge students and build their reasoning skills.
- Side Benefits:
  - Opportunity to meet other students
  - Building skills with online meeting platforms
  - Turn taking and other social skills

## Slide 24: Targeted Symbols and Math Concepts – Lessons 1-3

- Lesson 1 – fractions, mixed numbers, less than or equal to, greater than or equal to, and not equal to
- Lesson 2 – decimal, percent, dollar sign, cent sign, and approximately equal to
- Lesson 3 – parentheses, negative sign, order of operations, and absolute value (vertical bars)

## Slide 25: Targeted Symbols and Math Concepts – Lessons 4-6

- Lesson 4 – math and science-related tables, coordinate pairs, and the mathematical comma
- Lesson 5 – exponents and degrees, including the superscript indicator, baseline indicator, hollow dot
- Lesson 6 – principal square roots

## Slide 26: Lesson Symbol List

Each lesson was started by going through the symbols being used during the lesson.

Project INSPIRE Middle School Nemeth in a Box

### Nemeth in a Box Symbol List

**Lesson 1**

- ⠠ plus
- ⠠ minus sign
- ⠠⠨ equals sign (is equal to)
- ⠠⠨ not equal to
- ⠠⠨ greater than
- ⠠⠨ greater than or equal to
- ⠠⠨ less than
- ⠠⠨ less than or equal to
- ⠠⠨ opening and closing simple fraction indicators
- ⠠ horizontal fraction line
- ⠠⠨ opening and closing mixed number fraction indicators
- ⠠ general omission symbol
- ⠠⠨ long dash

**Lesson 2**

- ⠠ multiplication cross (times)
- ⠠ multiplication dot
- ⠠ divided by
- ⠠⠨ approximately equal to

# Slide 27: Maze from Lesson 5

**5 Superscript and Degree Symbols Maze for Middle School Students Layout and Answer Key**

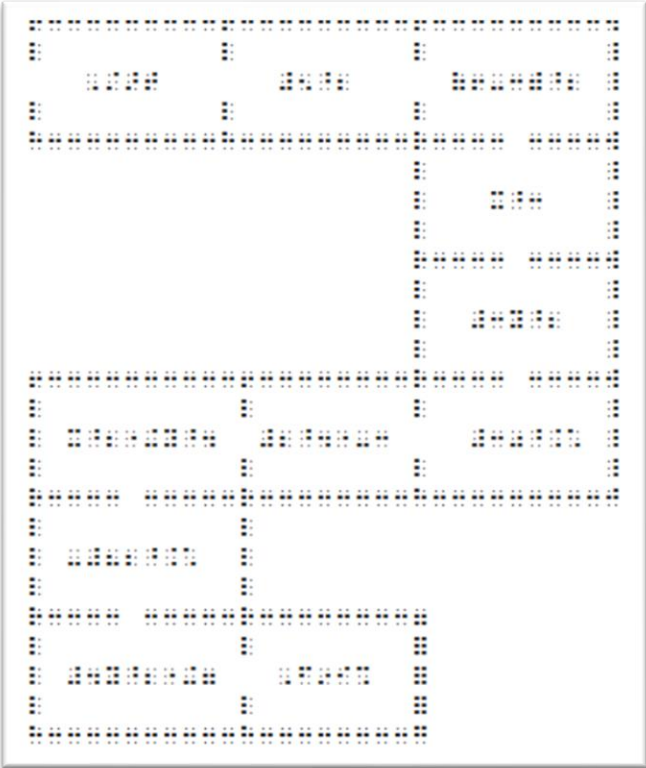
**Key**

Read each math expression as you advance through the maze.

Start

$5^2$	five squared	⠠⠠⠠⠠⠠
$(6 - 3)^2$	open parenthesis six minus 3 close parenthesis squared	⠠⠠⠠⠠⠠⠠⠠⠠
$x^3$	x cubed	⠠⠠⠠
$3y^2$	three y squared	⠠⠠⠠⠠⠠
$30^\circ$	thirty degrees	⠠⠠⠠⠠⠠⠠
$2^4 - 3$	two to the fourth power minus three	⠠⠠⠠⠠⠠⠠⠠
$x^2 + y^4$	x squared plus y to the fourth power	⠠⠠⠠⠠⠠⠠⠠⠠
$-82^\circ$	negative eighty-two degrees	⠠⠠⠠⠠⠠⠠⠠
$4y^2 + 7$	four y squared plus seven	⠠⠠⠠⠠⠠⠠⠠

Finish





## Slide 28: What is Wrong? From Lesson 3

### What is Wrong Lesson 3

Check out this puzzle. Read the expressions in each of the four quadrants. Find "What is Wrong" with each of the first three. It is a common mistake. The last one is always correct. If you think you are on a roll, try to find two mistakes in the challenge puzzle.

Negative five plus open parenthesis eight minus six close parenthesis

Challenge (Find two mistakes.)

Negative eight plus the absolute value of negative three equals negative five



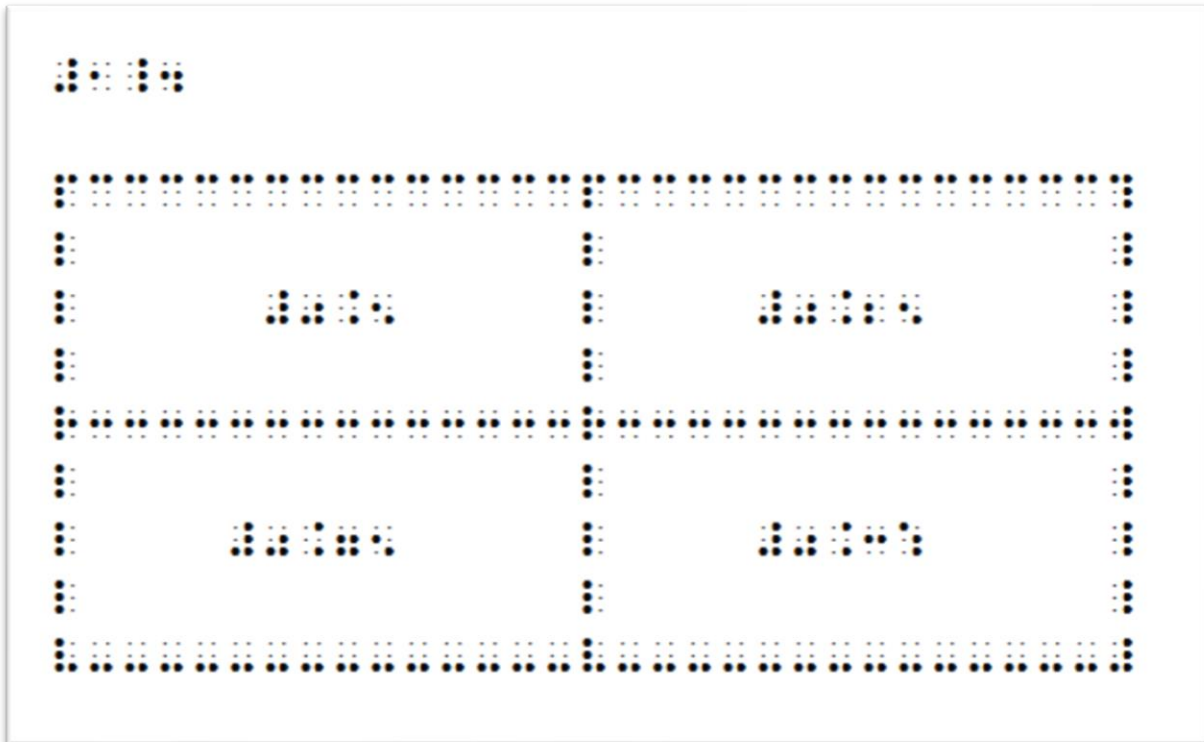
## Slide 29: Which One Doesn't Belong? From Lesson 2

### Which One Doesn't Belong Lesson 2

Read the expression in each of the four quadrants and share your reasoning as to "Which One Doesn't Belong and Why?" The great thing about this is that there are no wrong answers, as long as your reasoning is true.

1.

0.5	0.25
0.75	$0.\bar{3}$



## Slide 30: What is the Question? From Lesson 1

### What is the Question Lesson 1

Now is your chance to be creative! You will be given the answer and need to come up with a question which gives you that answer. There is an example of a question to get you started, but you must come up with your own. How hard can you make it and still come up with the same answer? How many different symbols can you use and still get that same answer?

Answer:  $5\frac{1}{2}$

Question example:  $2\frac{1}{4} + 3\frac{3}{4} - \frac{1}{2} = ?$

Your question that gives the same answer:



## Slide 31: What Students Liked Best

- We got to learn new symbols that I never knew.
- I liked getting to know new people and play the math games.
- I enjoyed most though, the puzzle, "Which one Doesn't Belong." I enjoyed this because I got to give out my own opinion on which one I thought was different, and I also got to listen to other's opinions and choices.
- I enjoy the fact that I learned a lot more [Nemeth] symbols while still having fun.

## Slide 32: Mission INSPIRE

- Similar to a science fair.

- Offered in April & May 2022 and Spring 2023
- “Rocket Scientists” ages 11-15:
  - Build a rocket prototype with Mission Control.
  - Build their own rocket and test it.
  - Present their findings to Mission Control staff.

<https://www.pathstoliteracy.org/mission-inspire-stem-bowl/>

Image caption: Mission INSPIRE STEM Bowl logo that includes a picture of a rocket blasting off and an owl wearing glasses.

## Slide 33: Let’s Watch The Rocket Scientists’ Presentations Shared at the Hatch Closing Ceremony

A video will be played by the presenter.

## Slide 34: *Learning and Teaching the Nemeth Code Within UEB Contexts: A Step-by-Step Guide*

- FREE online resource written by Tina Herzberg, Susan Osterhaus, Sara Larkin, & L. Penny Rosenblum
- <https://www.pathstoliteracy.org/resource/learning-and-teaching-the-nemeth-code/>
- Eight chapters + appendices that systematically move through PK-to Algebra and Geometry
- Chapters include:
  - Introduction to new Nemeth symbols
  - Practice activities
  - Teaching tips
  - Chapter summary

## Slide 35: Project INSPIRE Publications

- Herzberg, T. S., & Rosenblum, L. P. (2022). Information gathered to assist in designing STEM braille training materials: Survey results. *Journal of Blindness Innovation and Research*, 12(1).  
<https://nfb.org/images/nfb/publications/jbir/jbir22/jbir120101.html>
- Herzberg, T. S., Wild, T., & Rosenblum, L. P. (2023). Nemeth in a box: Unpacking tools to build success in math for students with visual impairments, *Ohio Journal of School Mathematics*, 93, 34-39.
- Wild, T., Herzberg, T. S., & Rosenblum, L. P. (2023). Mission INSPIRE: Soaring to excellence in data analysis for students with visual impairments, *Science Scope*, 46(7), 8-12.

## Slide 36: Where to Find Project INSPIRE

- Paths to Literacy  
<https://www.pathstoliteracy.org/project-inspire>
- Facebook search for Project INSPIRE
- Website <https://www.uscupstate.edu/project-inspire/>
- Sign Up for Mailing list <https://bit.ly/3sL8luV>
- Dr. Rosenblum's email address [rosenblu@Arizona.edu](mailto:rosenblu@Arizona.edu)
- Dr. Herzberg's email address [Herzberg@uscupstate.edu](mailto:Herzberg@uscupstate.edu)