Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide

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Dedication

This book is dedicated to Dr. Abraham Nemeth. Without his diligent work in creating this amazing and comprehensive braille code, we would not have an efficient way for braille readers to access math and science content.

Acknowledgements

We have many individuals to thank who assisted us in making this book and accompanying instructor materials a reality.

In Spring 2019, Dr. Herzberg received funding for her sabbatical from the University of South Carolina Upstate. She used the semester to begin work on this book and to recruit the co-authors. We appreciate the University of South Carolina Upstate's recognition of the value of this project.

As we prepared this book, we had several university instructors and their students field test the materials. In addition, Drs. Herzberg and Rosenblum both field tested the materials with students in their own courses. We would like to thank the following instructors who provided feedback as they and their students used the book and accompanying materials:

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- Dr. Amanda Lannan, University of Kentucky
- Ms. Pat Leader, San Francisco State University
- Ms. Gina Mitchell, California State University Los Angeles
- Ms. Julie Wright, Portland State University

Dr. Holly Lawson at Portland State University had a student in her program who was a braille reader taking a class with Julie Wright. Dr. Lawson hired a transcriber with grant funds through the Portland State University's Disability Resource Center to produce the materials in braille for the student. This began the work the authors intended to make all materials accessible to braille readers.

Mr. Michael Cantino is the certified braille transcriber who prepared the materials for Portland State University. Mr. Cantino continued to work with the authors as they revised and finalized the content. We are incredibly thankful to Dr. Lawson and Mr. Cantino for providing the time and financial resources necessary to make these high-quality braille materials available for all individuals to use from this point forward.

The authors would like to acknowledge our families and their understanding of our commitment to the field of visual impairment. They supported us as we worked together to make the dream of this book come to fruition.

In the words of Helen Keller, "Alone we can do so little; together we can do so much!"

About the Authors

Tina S. Herzberg, Ph.D.

Dr. Herzberg is a Professor and Coordinator of the Visual Impairment Education Program at the University of South Carolina Upstate where she prepares teachers of students with visual impairments (TSVIs) for the state and region. As part of her responsibilities, she teaches courses in Unified English Braille (UEB) and Nemeth Code within UEB Contexts. Much of Dr. Herzberg's research focuses on braille literacy and science, technology, engineering, and mathematics (STEM) skills for students with visual impairments. She is the Principal Investigator for *Project INSPIRE: Increasing the STEM Potential of Individuals who Read Braille*, funded by the U.S. Department of Education, Office of Special Education and Rehabilitative Services. Since 2014, Dr. Herzberg has been a member of the Braille Formats Technical Committee for the Braille Authority of North America (BANA). Dr. Herzberg is a co-author of the Pearson *Nemeth Code Curriculum*. Her K-12 teaching experience occurred in Texas where she was a general education math and English teacher, teacher of students with visual impairments (TSVI), and team leader who supported other TSVIs for a regional service center.

Susan Osterhaus, M.Ed.

Ms. Osterhaus has a long career in mathematics education for students with visual impairments. In 1978 she began teaching mathematics at the Texas School for the Blind and Visually Impaired (TSBVI) and over the years has served in many roles at TSBVI. Currently she is the Statewide Mathematics Consultant in the Outreach Programs. With a state, national, and international reputation, Ms. Osterhaus has taken part in many research and curricula development projects. She serves on two committees for BANA: the Nemeth Code Technical Committee and the Tactile Graphics Technical Committee. She is a member of the Project INSPIRE team and a co-author of the Pearson *Nemeth Code Curriculum*. Ms. Osterhaus is also a co-author of *Nemeth at a Glance*.

Sara Larkin, M.A.

Mrs. Larkin has 18 years of experience teaching high school mathematics, computer programming, and computer networking in the general education setting. Since 2007, she has served as the Statewide Math Consultant for

the Iowa Educational Services for the Blind and Visually Impaired. Mrs. Larkin supports teachers throughout the state and provides workshops, trainings, and conference presentations both within her state and nationally in the areas of Nemeth Code, math technology, tactile graphics, abacus, and instruction strategies for teaching math to students who are blind. She is a member of the Project INSPIRE team and a co-author of the Pearson *Nemeth Code Curriculum*.

L. Penny Rosenblum, Ph.D.

Dr. Rosenblum retired from the University of Arizona in 2019 after 23 years preparing TSVIs and conducting research. She frequently taught braille courses, most often courses in which students learned Nemeth Code and after 2016 Nemeth Code within UEB Contexts. Dr. Rosenblum served as the Project Director for two Institute of Education Sciences projects focused on increasing STEM learning for visually impaired students at the middle school level. She is a member of the Project INSPIRE team.

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Introduction

Welcome to *Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide.* The book was initially created for university programs to use in preparing teachers of students with visual impairments. However, this resource may also be helpful to individuals teaching and supporting Pre-Kindergarten-12th grade students who read and write braille. These individuals need up-to-date knowledge and skills in learning and teaching the Code, supporting students in the STEM classroom, and transcribing materials for students so they can be successful in science, technology, engineering, and mathematics (STEM) classes.

Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide provides opportunities to build Nemeth Code skills and learn about strategies and resources for teaching the Code. The book contains multiple examples of STEM materials transcribed into braille.

This book is organized systematically. It begins with teaching the Nemeth Code to young students, specifically from Pre-Kindergarten through 1st grade, in Chapters 1-2. Afterwards, individuals will learn about how to teach the Nemeth Code to students in 2nd-6th grades in Chapters 3-5. It is probably not a surprise, but Chapters 6-8 focus on teaching the Nemeth Code to secondary students. The book concludes with appendices, including information on Greek letters, biology formulas, chemical notation and formulas, and physics formulas.

Throughout *Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide*, we have included:

INTRODUCTION TO NEW NEMETH SYMBOLS: Each chapter begins by introducing Nemeth symbols included in the chapter.

PRACTICE ACTIVITIES: There are reading and writing activities to complete as new Nemeth Code symbols are introduced. Answer keys for the practice activities are provided at the end of the chapter.

TEACHING TIPS: Throughout the book, we provide strategies on how to teach the Nemeth Code symbols to students.

CHAPTER SUMMARY: Each chapter contains a summary of key points about the math topics covered in the chapter and the rules about how to transcribe the symbols for Nemeth Code within UEB Contexts.

So, let's get started learning more about Nemeth Code!

Resources and Terminology

Mathematical content throughout this book is transcribed according to the following guidelines published by the Braille Authority of North America:

- *The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision,* including the 2007-2015 updates
- 2018 Guidance for Transcription Using the Nemeth Code within UEB Contexts
- *Braille Formats: Principles of Print-to-Braille Transcription, 2016*
- *Braille Code for Chemical Notation, 1997*
- 2017 Provisional Guidance for Chemistry Notation Using Nemeth in UEB Contexts
- *Guidelines and Standards for Tactile Graphics, 2010*

The Nemeth Braille Code for Mathematics and Science Notation, 1972 Revision (referred to as the *Nemeth Code* Book) is currently being revised. *Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide* will be updated upon its publication.

The ***Nemeth Code Book*** is organized into rules and sections that contain detailed explanations and examples. We are cross-listing the rules and sections for braille symbols and rules throughout *Learning and Teaching the Nemeth Code within UEB Contexts: A Step-by-Step Guide* so they may easily be located in the *Nemeth Code Book* for additional information and examples. These rules and sections are designated in parentheses similar to the following example: (Rule II, §7).

The *Rules of Unified English Braille, Second Edition, 2013* is the UEB Rulebook. We are only cross-listing the rules for Nemeth indicators included in the UEB Rulebook. These sections are designated in parentheses similar to the following example: (*UEB Rulebook*, 14.6).

The term ***Braille Formats*** refers to *Braille Formats: Principles of Print-to-Braille Transcription, 2016*. *Braille Formats* is organized into sections and also contains detailed explanations and examples. In the chapters, we cross-list the sections so they may be easily located. These sections are designated in parentheses similar to the following example: (*Braille Formats*, 4.4.1).

As used in the *Nemeth Code Book,* the term **sign** in this book refers to a character or a series of characters in the print copy, and the term **symbol** refers to a character or a series of characters in braille.

The Development of the Nemeth Code

Dr. Abraham Nemeth (1918-2013) invented the Nemeth Code. The book, *The Nemeth Braille Code for Mathematics and Science Notation, 1972 revision* provides the rules that govern the Nemeth Code. Throughout his adult life, Dr. Nemeth was committed to ensuring people who are blind could access mathematical content. To learn more about Dr. Nemeth, visit the references below.

References

Kendrick, D. (2013). *Dr. Abraham Nemeth: Inventor, professor, Hebrew scholar, and federationist dies at 94*. https://nfb.org/images/nfb/publications/bm/bm13/bm1310/bm131002.htm

Yardley, W. (2013, October 6). *Abraham Nemeth, creator of a braille code for math, is dead at 94.* https://www.nytimes.com/2013/10/07/us/abraham-nemeth-creator-of-a-braille-code-for-math-is-dead-at-94.html