Braille Module 1

Introduction to Braille
Module 1

Introduction to Braille

Summary

Goal: Students will demonstrate a basic understanding of the braille system, how it was invented, and its importance to persons who use this system for literacy.

SMART Objectives: Specific, Measurable, Achievable, Realistic, and Time-sensitive

By the end of this module, students should be able to:

BS1.1: Identify and describe the braille cell.

BS1.2: Summarize basic information about the invention of the braille system.

BS1.3: Identify 3 ways in which braille is produced.

BS1.4: Learn about the life of Louis Braille.

BS1.5: Understand how braille evolved into the system used today.

Instructor:
- Braille instructor

Delivery Method(s):
- Lecture
- Classroom reading
- Discussion
- DVD presentation
- Group research

Length: 5 hours
Five topics

Any Applicable Business and/or Soft Skills:

Corresponding LOC Manual:
This module precedes LOC Manual materials.

Take Away Message(s): This module is an introduction to the braille system. You were able to examine how braille was invented, implemented and has evolved over the years. You learned the 3 ways braille is produced and how you will create books from print to braille. This module also explained how the braille system works.

You are on your way to bring high-quality reading material to the braille reader. This course will give you all the tools to be a successful, certified braille transcriber. Through hard work and commitment, great things can be accomplished.
Title of Module: Introduction to Braille

The purpose of this module is for the students to be introduced to the basic structure of the braille system. They will gain an understanding of the braille system, how it was invented, and its importance to persons who use this system for literacy.

Agenda – *topics to be covered in the module and length of each item*

<table>
<thead>
<tr>
<th>Topic: Introduction to Braille</th>
<th>Time Allotted</th>
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<tbody>
<tr>
<td>A. The Importance of Braille as a Reading and Writing Medium</td>
<td>(30 minutes)</td>
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<tr>
<td>B. The Basic Structure of the Braille System</td>
<td>(30 minutes)</td>
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<tr>
<td>C. How Braille Is Produced</td>
<td>(1 hour)</td>
</tr>
<tr>
<td>D. The Invention of the Braille System and the Life of Louis Braille</td>
<td>(2 hours)</td>
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<tr>
<td>E. The Evolution of Braille: Part 1</td>
<td>(1 hour)</td>
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Materials and Supplies – *items needed in order to carry out the agenda and classroom activities*

1. DVDs: Hands on Books (1.B.2), Orientation to the Perkins Brailler (1.C.1), Braille Technology and Braille Transcribing Software and Embossers (1.C.2)
2. DVD player/TV or projector/screen/computer for videos
3. Colored pencils and note paper
5. Perkins Brailler
6. A braille slate & stylus
7. Question cards & container
Classroom Preparation – *steps to follow when setting up the learning environment*

1. The instructor should download from the web posters and photographs of the braille code, pictures of children and adults reading and writing braille, and a braille book or magazine, and bring these things to the facilities for the participants to view.

2. The room should be arranged to allow comfortable interaction between students and the instructor during small and large group activities.
Curriculum Content

A. The Importance of Braille as a Reading and Writing Medium  (30 minutes)

Objective BS1.1: Identify and describe the braille cell.

PREINSTRUCTIONAL ACTIVITIES

In this module the students will learn about the basics of braille transcription.

The instructor will be familiar with the basics of braille transcription as a reading and writing medium. There are many resources that can be acquired from the internet for further information.

CONTENT PRESENTATION AND LEARNER PARTICIPATION

Ask the students: “What is braille?” The instructor will moderate a short discussion to elicit participant’s prior knowledge of, and experience with braille, such as braille menus, braille in elevators, and braille signs.

Ask the students: “Have you ever seen braille in a public place like on the button panel to an elevator or on a menu?” The instructor will moderate a short discussion to see how familiar the students are to braille.

The instructor will make a brief presentation to introduce the course in braille transcription that will begin in the next module, i.e. expectations, requirements and outcomes. The instructor will give a brief overview of the content in this module, for example:

“Today we will learn about the basic structure of the braille system. We will see it used by students in a public school setting, learn about how it is produced, and examine its development by its inventor, Louis Braille.”

Braille is a system in which reading and writing are done through touch rather than vision. Braille is not a language, but a reading and writing medium. Braille is made up of dots set in 6 dot groups called cells. Each cell is two dots wide and 3 dots high. The spacing, size and height of the dots are very exact. The braille cell fits perfectly under the human fingertip.

B. The Basic Structure of the Braille System  (30 minutes)

Objective BS1.2: Summarize basic information about the invention of the braille system.

PREINSTRUCTIONAL ACTIVITIES
In this module the students will learn about the structure of the braille system.

The instructor should be familiar with the subject by reviewing the handout and DVD prior to the class.

You will need copies of the handout: **Five-Minute Introduction to Braille (1.B.1)**.

You will need the DVD: the **Hands-On Books DVD (1.B.2)** by National Braille Press.

**CONTENT PRESENTATION AND LEARNER PARTICIPATION**

Present the **Five-Minute Introduction to Braille (1.B.1)** handout. Give students several minutes to examine the handout.

Explain that there are 63 combinations of the dots and spaces within one cell. These 63 symbols are used many times in different contexts to represent letters, punctuation, numbers, mathematic and scientific symbols, musical notes, etc.

Show the **Hands-On Books DVD (1.B.2)**. Following the DVD, briefly explain that braille transcribers primarily prepare educational materials, tests, and books for students in schools like the students in the DVD. It will be important for the students to respect the braille reader by developing their skills to competently and accurately prepare the braille readers’ materials so that they will succeed in their studies.

C. How Braille Is Produced  

(1 hour)

Objective BS1.3: Identify 3 ways in which braille is produced.

**PREINSTRUCTIONAL ACTIVITIES**

In this module the students will learn about ways braille is produced.

The instructor should be familiar with the subject by reviewing DVDs prior to the class and being familiar with the handouts.


**CONTENT PRESENTATION AND LEARNER PARTICIPATION**

The instructor will explain to the class:
“You will become very familiar with the Perkins Brailler in the coming weeks. The Perkins Brailler is the most common means of writing braille. This machine has not changed much in the last 50 years. In fact this machine was the inspiration for the manual typewriter. Along with the brailler you will learn to use the six key entries on the computer. Braille transcribers use the computer today to transcribe print materials into braille and send them to an agency or organization to be embossed on a large braille embosser. You will also watch two DVDs. One is about learning to transcribe using the Perkins Braillewriter and one is about producing braille with other technology. There is an additional means of writing braille through the use of a slate and stylus. The paper is placed inside the slate. The openings on top are over a cell underneath. The stylus is used to press each dot into the cell. Writing is done from right to left as the dots are pressed into the cell underneath. Then the paper is removed and reversed in order to be read from left to right. You will have the opportunity to use the slate and stylus in future lessons.”

Present the DVD: **Orientation to the Perkins Brailler (1.C.1)**. This DVD explains how to use the Perkins Brailler. Allow time for questions and answers.

Present the DVD: **On Braille Transcribing and Braille Embossers (1.C.2)**. This DVD explains how to transcribe and emboss braille. Allow time for questions and answers.

The instructor will present the **Braille Alphabet (1.C.3)** handouts to the students. Colored pencils should be available. Ask students to write their names in the blank cells below the alphabet by filling in the appropriate dots for each letter using the simulated alphabet. Using colors will give the activity some flair. The instructor should encourage conversation about their observations of the information presented.

The instructor will pass out the handout: **About Braille (1.C.4)**. Ask the students to carefully read the handout silently. The students will be given five to seven minutes to read the handout. After the reading, the instructor may choose to discuss or summarize the handout.

**D. The Invention of the Braille System and the Life of Louis Braille (1 hour)**

Objective BS1.4: Learn about the life of Louis Braille.

**PREINSTRUCTIONAL ACTIVITIES**

The instructor will be familiar with the information on Louis Braille.

You will need copies of: **200 Years: The Life and Legacy of Louis Braille (1.D.1)**, the **Louis Braille Quiz (1.D.2)** and **Louis Braille Quiz Answer Sheet (1.D.3)**. Twenty questions related to the handout, each printed on a separate card, should be placed in a container in a central location.
CONTENT PRESENTATION AND LEARNER PARTICIPATION

The instructor will introduce the life of Louis Braille and the invention of the Braille System. Without the significant contributions made by Louis Braille to the world almost 200 years ago, many people who cannot see well enough to read print, would not have had the opportunity to read and write by touch.

The instructor should divide the students into three or four equal groups. Each student will be given the 200 Years: The Life and Legacy of Louis Braille (1.D.1) packet. Each group should select a spokesperson. The instructor will hand out the quiz. This quiz provides twenty questions related to the handout. Each question should be printed on a separate card and placed in a container in a central location. Each group leader will take turns drawing questions from the container so that each small group has an equal number of questions. The groups will be given 30 minutes to read the packet and answer the questions from the Louis Braille Quiz (1.D.2). The instructor will need to monitor time and move between groups offering assistance. Each group will be given 5-7 minutes to present to the class. They can choose to focus on one question or they can answer all of their questions. Finally, with the groups still seated together, ask each group to share what they felt was the most important information discovered during this activity.

ASSESSMENT

After adequate time has passed, ask groups to report some of their thoughts about each question.

During the final ten minutes of the class the instructor will summarize the content of this module. During this period the students will be encouraged to ask questions and share their reactions to the module.

The assessment for this module will be through teacher observation of student participation and interest.

E. The Evolution of Braille: Part 1  
(1 hour)

Objective BS1.5: Understand how braille evolved into the system used today.

PREINSTRUCTIONAL ACTIVITIES

The instructor will be familiar with the handout: The Evolution of Braille: Part One (1.E.1) from the winter 2011/2012 CTEBVI Journal (Vol. LIII, No. 3).

You will need copies of: The Evolution of Braille: Part 1 (1.E.1).

CONTENT PRESENTATION AND LEARNER PARTICIPATION
The instructor will moderate a short discussion to elicit participant’s prior knowledge of the evolution of braille from the information they have already studied.

The instructor will pass out *The Evolution of Braille: Part 1 (1.E.1)* handouts to the students. As a class the students will read this handout.

**ASSESSMENT**

Please leave time for questions and answers to assess how much the students have grasped.
Braille Module 1

Introduction to Braille

Handouts & Answer Sheets
**Five-Minute Introduction to Braille (1.B.1)**

Braille is a system of transcribing print so it can be read by touch. Braille is now mainly used by blind people but the original idea was for soldiers to be able to read at night without putting themselves in danger by using any light. You can learn about braille by reading this page and following the links.

**Cells**

The characters of the standard braille alphabet are called cells and consist of dots placed on a two-column grid with three positions in each column; there are 63 different cells not counting the space. The positions are normally numbered starting at the top of the left-hand column as shown in Figure 1. The two main forms of tactile braille are embossed paper braille and refreshable braille displays (RBDs) in which an electronic signal results in pins moving up and down to make a row of cells. Braille readers use RBDs as computer monitors.

![Figure 1: Dot positions](image)

**Codes**

A natural question is what the braille cells mean. However, the cells have no intrinsic meanings; since there is only one standard braille alphabet, the cells mean different things depending on which braille code is in use: math, music, Japanese, etc. The most common code in the United States is literary braille, or more accurately, standard English Braille American Edition (EBAE).
Braille is not just one-to-one with print and—even within a single code— the same cells are re-used to have different meanings in different contexts. For example, the cell for the letter "p" in literary braille means "people" when it stands alone as a word. (The use of context-dependent shorthand is one reason why transcribing from print to braille isn't straightforward; much transcribing today is done with computer applications, such as that produced by Duxbury Systems, Inc.)

The braille shorthand symbols are called contractions. In addition to whole-word contractions, there are also numerous part-word contractions. The rules for using contractions aren't simple; one needs to either look them up in a reference or learn them from a source like braille through Remote Learning. In addition to contractions, the other unique aspect of braille codes are their use of HTML-like embedded markup or composition indicators, such as when the cell with a single dot in position 6 is placed before a letter cell in literary braille. It means that the letter is capitalized.

**Memorizing the dots**

One way to learn the alphabet in literary braille is to memorize the dot patterns for the first ten letters, a-j, shown by the simulated or ink-print braille cells in Figure 2. (The shadow dots in empty positions are for sighted persons and are not used in embossed braille.)

![Figure 2: Braille cells a-j in alphabetical order](image)

The dot patterns for the next ten letters, k-t, are the same as the first ten but with an additional dot in position 3. The dot patterns for the letters u, v, x, y, and z are the same as the letters a-e with additional dots in positions 3 and 6. The letter "w," dot pattern 2-4-5-6, is out of alphabetical order because the French alphabet did not have that letter when Louis Braille invented the braille alphabet in 1829.
All 63 braille cells are shown with their literary braille identifications on our Find-A-Cell chart. The Find-A-Cell chart can be used to quickly locate the meaning of an unknown dot pattern. (Note that a more common way of displaying the braille cells is the so-called standard order with five rows of ten cells followed by one row of six and one of seven as Illustrated by the braille ASCII chart.

**A new method**

Figure 3 shows a different arrangement of the first ten cells that you may find make it easier to memorize their dot patterns.

Dotless braille tip: Note that the dot patterns of the braille cells In the sequence "aced" all have a dot in dot position one and a simple progression of zero, one, or two dots in dot positions four and five of the right-hand column of the cells. The dot patterns of the cells in the sequence "bfg" are the same as the corresponding cells in the "aced" sequence except for the addition of a dot in dot position two while the dot patterns for "ij" are the same as for "cd" except for a dot in position two instead of position one.

If you are familiar with the binary number system, you may have realized that the order in Figure 3 is based on interpreting the braille cells as binary-coded numbers that use filled positions for ones and empty positions for zeroes. This means that you can use the numbers to reconstruct the dot patterns. The octal numerical values used in Figure 3 are based on our particularly useful NUMBRL assignment of place values to the dot positions.

![Figure 3: Braille cells a-j in their numerical order by their NUMBRL code](http://www.dotlessbraille.org/Five.htm, 05/02/2012)
# Braille Alphabet (1.C.3)

<table>
<thead>
<tr>
<th>A</th>
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<th>J</th>
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<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
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<th>U</th>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>Caps</th>
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1.C.3

Braille Module 1-13
About Braille (1.C.4)

Reading by Touch

Braille is a system of touch reading and writing in which raised dots represent the letters of the alphabet and numbers, as well as music notes and symbols. Braille contains symbols for punctuation marks and provides a system of contractions and short-form words to save space, making it an efficient method of tactile reading.

Braille is read by moving one or more fingers along each line. Both hands are usually involved in the reading process, and reading is generally done with the index fingers. Usually, one hand reads the majority of one line while the other hand locates the beginning of the next. Average reading speed is approximately 125 words per minute, but greater speeds of up to 200 words per minute are possible.

By using braille, blind people can review and study the written word. They may become aware of conventions such as spelling, punctuation, paragraphing, and footnotes. Most important, braille provides blind individuals access to a wide range of reading materials—educational and recreational reading as well as informational manuals. Blind people also are able to pursue hobbies and cultural enrichment with such braille materials as music scores, hymnals, playing cards, and board games.

The History of Braille

The system of embossed writing invented by Louis Braille in 1821 gradually came to be accepted throughout the world as the fundamental form of written communication for blind individuals.

Various methods—many of them raised versions of print letters—had been attempted over the years to enable blind people to read. The braille system has succeeded because it is based on a rational sequence of signs devised for the fingertips, rather than imitating signs devised for the eyes. In addition, braille can be written by blind people and used for any notation that follows an accepted sequence, such as numerals, musical notes, or chemical tables.

Braille has undergone many modifications, particularly the addition of contractions representing groups of letters or whole words that appear frequently in a language. The use of contractions permits faster reading and helps reduce the size of braille books, making them less cumbersome.

Several groups have been established over the past century to modify and standardize the braille code. The major goal is to develop easily understood contractions without making the code too complex.

The official braille code, *English Braille, American Edition (EBAE)*, was first published 1.C.4
In 1932 by what is now the Braille Authority of North America (BANA). This organization represents many agencies and consumer groups and has been responsible for updating and interpreting the basic literary braille code and the specialized codes for music, mathematics, computer braille, and other uses in the United States and Canada. Other countries have similar authorities.

**Louis Braille: A Remarkable Inventor**

In 1821 a blind twelve-year-old boy took a secret code devised for the military and recognized in it the basis for written communication for blind individuals. Louis Braille, enrolled at the National Institute of the Blind in Paris, spent many years developing and refining the system of raised dots that has come to be known by his name.

The original military code was called night writing and was used by soldiers to communicate after dark. It was based on a twelve-dot cell, two-dots wide by six-dots high. Each dot or combination of dots within the cell stood for a phonetic sound. The problem with the military code was that a single fingertip could not feel all the dots with one touch.

Braille created a reading method based on a cell of six dots. This crucial improvement meant that a fingertip could encompass the entire cell unit with one impression and move rapidly from one cell to the next.

**Early Life**

Braille himself was blind from the age of three. He was born in the village of Coupvray near Paris on January 4, 1809. One day he was playing with a sharp tool belonging to his father, a harness maker. The child accidently injured one eye with the tool and developed an infection that later caused total blindness.

Until 1819, Braille attended the local village school, where his superior mental abilities put him at the head of his class. He received a scholarship to the National Institute of the Blind, where he was the youngest student. Soon afterward, he began the development of the embossed code. In 1829 he published the code in *Procédé pour Ecrire les Paroles, la Musiqueet la Plain-Chant au Moyen de Points*, which also contained a braille music code based on the same six-dot cell.

After he developed his system for reading and writing, Braille remained at the institute as an instructor. Eventually an incessant cough made it impossible for him to lecture. He died at the age of forty-three, and was buried in the family plot in the village cemetery in Coupvray. In 1952, on the centennial of his death, his body was ceremoniously transferred to the Pantheon in Paris. A monument to Louis Braille stands in the main square of Coupvray.

**The Braille Alphabet**
The braille cell, an arrangement of six dots, is the basic unit for reading and writing braille. Sixty-three different patterns are possible from these six dots. For purposes of identification and description, these dots are numbered downward 1-2-3 on the left and 4-5-6 on the right:

1 ● ● 4
2 ● ● 5
3 ● ● 6

(Note: As shown here, the “●” symbol represents a raised braille dot in the six-dot configuration. The “○” symbol represents a position in the cell where no braille dot occurs.)

The first ten letters of the alphabet (a–j) use only the dots in the upper two rows of the cell.

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The next ten letters of the alphabet (k–t) are formed by adding dot 3 to each of the first ten letters.

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The remaining letters, except for w, are formed by adding dots 3 and 6 to each of the first five letters.

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The letter “w” is an exception because the French alphabet did not contain a “w” when the code was created; the symbol for “w” was added later.

**Braille and Advances in Technology**

Access to information in braille has evolved considerably in recent years. Braille can now be translated and formatted with a computer. Braille characters can be entered directly into a computer with six keys on the computer’s keyboard. In addition, text that is entered into a computer via scanning or typing can be put into braille by using special software programs. Braille embossers can take output from a computer and produce single or double-sided braille materials in a fraction of the time it took to create braille by hand. While this process represents a major advance in braille production, computer-assisted braille translation is not perfect and materials must always be checked by a qualified braille proofreader.

Blind individuals use devices with refreshable braille displays to take notes, read braille materials, prepare school assignments, and perform many other tasks in braille that were not possible even twenty years ago. These advances in braille technology have had a profound impact on educational and professional opportunities available to blind braille readers.

**Braille Transcribers and Proofreaders**

Throughout the United States, dedicated braille transcribers and proofreaders work, often on a volunteer basis, to produce braille materials. These materials supplement the books and magazines produced in quantity by the LOC and other organizations. Sighted and blind individuals may become certified after completing a lengthy, detailed course of braille transcribing, culminating in the award by the Library of Congress of a certificate of proficiency in the appropriate braille code.
Their activities include transcribing print material into braille, duplicating/embossing copies, binding braille books, preparing materials for use with electronic refreshable braille displays, and proofreading.

Many braille transcribers and proofreaders work as volunteers for LOC and its national network of cooperating libraries that distributes books and magazines to blind and physically handicapped readers, state departments of special education, and local school systems.

Many individuals work as volunteers to gain the experience necessary to be hired by braille production agencies and school systems. The National Braille Association (NBA), a professional organization for transcribers, provides transcribers with guidance and professional development opportunities.

Brailling is a skill that requires training, intellectual curiosity, patience, meticulousness, and the abilities to work under pressure and to understand and follow directions. Braille transcribers report a great sense of accomplishment in learning a completely new system of reading and writing, and in empowering blind people to independently access the reading materials they need for education, work, and other life activities.

Taken from http://www.loc.gov/nls/reference/factsheets/braille.html, 05/01/2012
200 Years: The Life and Legacy of Louis Braille (1.D.1)

Introduction

Celebrating the Bicentennial of Louis Braille’s Birth

The Louis Braille Museum illustrates the life and legacy of the creator of the braille code—a system of raised dots representing letters, numbers, and punctuation which revolutionized the way blind people read and write.

Using photographs, engravings, and illustrations from books preserved in the American Foundation for the Blind's Archives and Rare Book Collection, the museum traces Louis Braille's life from his childhood in Coupvray, through his student years in Paris, to his invention of the braille code, and the recognition of its importance throughout the world.

Figure 1: Postcard with drawing of Louis Braille by Jean Roblin. Below the picture is Louis Braille’s name written in Braille.
Coupvray: Louis' Childhood Home

Born in Coupvray

Louis Braille was born on January 4, 1809 in Coupvray, a small French village 25 miles east of Paris. Louis was the fourth child of Simon-René Braille and Monique Baron. Simon-René was a master harness maker who was respected throughout the Coupvray region for his craftsmanship as a maker of high-quality leather goods for horses. His success as a craftsman helped Louis' father to purchase land, farm buildings, and a vineyard in Coupvray and to provide a comfortable life for his family.

Accident in the Workshop

One day when Louis was 3 years old and was playing in his father's workshop, he picked up a sharp awl and tried to make a hole in a piece of leather as he had seen his father do many times. The young child lost control of the tool and stabbed himself in his right eye, crying out in pain. When his parents reached him, his eye was streaming blood. A local remedy of lily water was applied to the injury, probably aggravating the already badly inflamed eye. The infection spread quickly to Louis' left eye. Both eyes continued to deteriorate and by the time Louis was 5 years old he was completely blind.

Figure 2: Close up of the wooden sign on the side of Louis Braille's house. Bourlier means harness maker.
An Independent Louis

Braille's parents were determined that Louis should be educated to become independent — a remarkable expectation at a time when many blind people in rural France lived by begging or peddling. Both Simon-René and Monique Braille could read and write and they recognized the importance of education for the intelligent child. Louis was taught to read and write by feeling nails hammered into boards in the shapes of letters. His father also carved a wooden cane for Louis so that he could learn to navigate his home and village without assistance.

Louis began his formal education in 1815 when he received private lessons from the new village priest, Abbé Palluy. The priest soon recognized that the young boy was fully capable of a normal education regardless of his lack of vision. The following year, Louis was admitted to the town school, where he received instruction side by side with his sighted peers. He quickly showed himself to be one of the brightest pupils in the school.

Louis' Education

Louis had to memorize what he learned when he received instruction from Abbé Palluy and the local school teacher, Antoine Becheret. In 1818, when he was 9 years old, Louis' schooling was disrupted by the government's introduction of a new method of teaching called "mutual instruction." The method was based on students instructing one another, thereby reducing the central role of the teacher in the classroom. Abbé Palluy strongly disliked the new method and searched for alternative educational options for Louis. He learned about a school in Paris dedicated to teaching children who were blind, and with the help of a local nobleman arranged for Louis to attend the school on scholarship. Louis' parents realized that he needed special instruction if he was to progress, and, after much soul-searching, they agreed to send him to the Institute for Blind Youth in Paris.
Paris: Institute for Blind Youth

Valentin Haüy, the School's Founder

The school where Louis Braille was to spend the rest of his life — as both pupil and teacher — was called the Institute for Blind Youth. The Institute was the first school for blind children anywhere in the world. It was founded in 1786 by Valentin Haüy, a pioneer in the education of students who are blind. Haüy was born in 1745, and when he was in his twenties, he witnessed an incident where blind people were ridiculed and made fun. A clever and compassionate man, he became interested in education for those who were blind. He was particularly dedicated to developing a way to teach reading and writing. Through experimentation Haüy developed a revolutionary process for embossing books — books that had raised bumps in the form of letters.

In June 1784, Haüy asked a 17-year-old boy who was blind, named François Le Sueur, to study with him and offered to pay him as much as he was earning through begging. In only three months he taught François to read and write using embossed books. Over the next few years he was able to raise money to open a school, where the curriculum focused on academics, music, and manual skills. In 1801, the Institute for Blind Youth was merged with another famous institute for blind people, and Haüy resigned.

Arrival at the Institute for Blind Youth

Louis Braille was only 10 when he traveled to Paris with his father on February 15, 1819, to enroll at the Institute for Blind Youth. Although a trip from Coupvray by stagecoach took only four hours, it was to be a life-changing journey for Louis. He was greeted kindly by Sébastien Guillié, the school's director.

Despite the sometimes harsh conditions of school life, Louis loved attending the Institute for Blind Youth. The school had been at its present location since 1816, and although the living conditions at this school were far better than at its previous location, it was filthy and damp. Students with no vision found it hard to walk about the poorly kept building, which was over 200 years old. The building had been used, among other things, as a prison during the French Revolution.
When Louis arrived at the school, there were 60 boys and 30 girls. He became friends early on with Gabriel Gauthier, who remained a close friend for the rest of his life. Louis particularly enjoyed weekly outings to the botanical gardens, when each child would hold onto a rope that kept the group together as the children walked through the city streets.

Figure 3: The image depicts the equipment used to teach reading and writing to blind students. On the top left-hand side is a board with eight horizontal grooves; one groove contains letters forming the word “dieu” (god). Below this board are enlarged examples of three wooden letter tiles. On the right-hand side is a slanted wooden table with compartments containing different letters.

The School Curriculum

The school’s director, Guillié, was one of only three teachers for ninety pupils at the Institute. All the teachers were sighted. Under Guillié’s system, the brighter pupils instructed other students. Much of the work done by the students was through memorization, as it had been for Louis in Coupvray. The lessons included Greek, Latin, algebra, and French grammar. Students were also taught practical skills designed to help them find work, such as chair caning, making slippers, and basket making.

Louis was an excellent student. Between the ages of 11 and 16, he won prizes in 1.D.1
several academic subjects as well as in the cello and piano. Louis' considerable musical talent flourished at the Institute, and he found work as an accomplished organist when he was older.

**Braille Invents His Code**

*Louis Perfects His System*

In 1821, shortly after becoming the Institute's new director, Dr. Alexandre François-René Pignier invited Charles Barbier to address his students. Barbier was an artillery captain in the French Army who had devised a system for soldiers to communicate at night without a sound. His system combined 12 dots to represent sounds and he called it sonography. It is also referred to as "night writing." He believed his invention could be of great value to the blind.

**Figure 4: Louis Braille's Original French Alphabet**

Both students and teachers at the Institute were intrigued by the promise of sonography, and, despite the difficulty of the system, sonography was introduced in the school as an auxiliary teaching method. Louis and his classmates soon identified one of the chief flaws of Barbier's system in addition to its complexity: it was based on the 36 sounds of the French alphabet and did not lend itself to spelling or punctuation. Louis determined to take Barbier's system and improve upon it.
Between the ages of 13 and 16 Louis worked on perfecting an embossed dot system. Like Barbier's, Louis' system used raised dots, but beyond that similarity Louis' ideas were his own. For three years Louis spent his free time refining his code. On the weekends, evenings, and summer vacations in Coupvray, Louis could be found with paper, slate, and stylus diligently working.

When at age 15 he felt he had an adequate code, he shared it with Dr. Pignier, who had become his mentor. Louis' system, based on a six-dot cell, was both simple and elegant. A full braille cell consists of six raised dots arranged in two parallel rows, each having three dots. Sixty-three combinations are possible using one or more of these six dots. A single cell can be used to represent an alphabet letter, number, punctuation mark, or even a whole word.

Dr. Pignier encouraged the students at the Institute to use Louis' code. With it, they were able to achieve a level of literacy previously unavailable to them.

_Louis Becomes a Teacher_

When Louis was 19, Dr. Pignier hired him to be an apprentice teacher at the Institute at a salary of 180 francs per year. Louis taught several classes including algebra, grammar, and geometry, to both sighted and blind students. With the appointment to apprentice teacher, Louis moved out of a dormitory and was provided his own room.

In 1833 at the age of 24, Louis and two other blind friends including his best friend Gabriel Gauthier, were made full-fledged teachers. For his work Louis received a salary of 300 francs per year. After 1835, Louis only provided instruction to blind students. With his salary he was able to buy himself a piano, lend money to friends who were in need, and pay people to help write books using his code. In 1834, the Exposition of Industry was held in Paris, and Louis was permitted to exhibit his code and demonstrated it to attendees.

_Books in Braille_

In 1829 the Institute published Louis' book, _Method of Writing Words, Music and Plain Songs by Means of Dots for Use by the Blind and Arranged for Them_. In it, Louis explained how his code worked to produce letters, words, punctuation, capitalization, musical notes, and arithmetic symbols. The book was prepared using embossed type, but examples were provided in Louis' six-dot code.
In spite of poor health, Louis continued to make changes to his code and in 1837 he produced a second edition of *Method of Writing Words, Music and Plain Songs by Means of Dots for Use by the Blind and Arranged for Them*, followed in 1838 by *Little Synopsis of Arithmetic for Beginners*. In this book he not only describes how to make materials for mathematics, but he also provides ideas on how to write a textbook using his code. He recognized the need for uniformity in the production of textbooks and other material for readers who were blind.

In 1837, the Institute for Blind Youth produced the first full-length book published in braille, *A Brief History of France*. A copy of the book, one of only three extant copies, is preserved in the Rare Book Collection of the American Foundation for the Blind and is illustrated here.

**Figure 5:** "A Brief History of France" [Precis Sur L'Histoire De France], the first full-length book produced using the braille dot system. The book was published by the National Institute for Blind Youth in 1837.
Louis Invents Decapoint

Louis' genius did not end with the six-dot braille system. By the late 1830s, he was working on a method whereby people who were blind could communicate efficiently and swiftly with sighted people. The system was called Decapoint.

Decapoint utilized a set of 100 dots on a 10 by 10 grid. Each letter was based on a dot configuration that could be looked up on a table Louis developed.

The illustration at left shows the letters "a-w" and their numeric dot-matrix equivalent. The dots in the decapoint alphabet replicate the shapes of letters; all letters have a minimum height of 4 dots, those letters that have longer stems such as "p" or "d" are accommodated by 3 dots either vertically above or below the 4 main dots. Using a board with heavy paper on it and a stylus, the user could trace the dot patterns to represent letters. The person writing went from right to left. After he or she finished, the writer would turn the paper over and read from left to right. The letters could be felt or seen with the eyes.

Louis' next task was to invent a machine that could tap out the dot formations. He sought assistance from Pierre-François-Victor Foucault, a mechanic and former pupil of the Institute, to invent a machine to write decapoint without having to use a stylus to create every dot. The result was a machine called a raphigraphe (needle-writer). Foucault's machine was recognized with a platinum medal in 1843 by the Society for the Encouragement of National Industry.
Recognition of the Braille Code

Changing of the Guard

On May 7, 1840, Dr. Pignier was forced to retire from the position of director of the Institute and was succeeded by his former assistant, Pierre-Armand Dufau. Dufau did not approve of Louis Braille's code and banned its use by students and teachers at the Institute. It is said he did not like Louis's code because he was afraid that there would be no need for sighted teachers if everyone who was blind could read as a result of using braille.

In April 1843, Louis was forced by ill-health to convalesce for six months in Coupvray. When he returned to Paris he discovered that Dufau had burned 73 books produced by Guillié and Pignier using Haüy's embossing method. The director thought a different embossing system, in use in the United States and Scotland, was superior to Haüy's system. The method was called Boston Line Type, and eventually it was found to be less effective than Louis Braille's code.

Braille's Code Demonstrated

Dufau's aversion to Braille's code and his prohibition on its use at the Institute were countered by Joseph Guadet, his assistant, who supported the braille code. Guadet convinced Dufau to see the benefits of using Louis' code. On February 22, 1844, the Institute celebrated its move to a new building. During the dedication ceremony Guadet demonstrated Louis Braille's code. First a 15-page book entitled Account of the System of Writing in Raised Dots Used for the Blind was read to those in attendance. This text acknowledged Louis' accomplishments and outlined the steps in the development of his code. Next a child was sent out of the room. Another child was asked to use Louis' code to write poetry dictated by a visitor attending the celebration. The first child was asked to come back in the room and read the poetry from the page the second child had created.

The day of the demonstration is often said to be the day Louis Braille's code, the braille code, was accepted by the world. In 1850, Dufau acknowledged Braille's invention in a second edition of his book, Concerning the Blind, which had made no mention of Braille's contribution in the original 1837 version.
The Final Years of Louis Braille

Louis was officially diagnosed with tuberculosis in 1835. As the tuberculosis progressed, his health continued to deteriorate. In 1844, he was forced to retire to Coupvray for three years to regain his strength. When he returned to the institute in 1847 he reduced his class size because it was difficult for students to hear his weakened voice. Although ill health forced him to retire in 1850, Dufau agreed to keep him on at the Institute in exchange for giving piano lessons from time to time as his health allowed.

Louis Braille died on January 6th, 1852, two days after his 43rd birthday. His body was taken to Coupvray and buried in the local cemetery. Shortly before his death he dictated his will, in which he forgave all debts owed to him and gave monies to blindness and Catholic organizations.

Dissemination of Braille

After Louis' death in 1852, the braille code, the code he invented as a teenager, spread throughout the world. In 1878, a congress met in Paris and officially decided to adopt braille as the international system used for writing by the blind. However, this did not put an end to the use of multiple systems of embossed writing. In the United States, braille was first used in 1854 by the Missouri School for the Blind, but it took until 1917 for the United States to agree upon a braille standard. Up until then, competing systems of Boston Line Type, Moon Type, American Braille, British Braille, and New York Point were all used. It was not until 1932 that a uniform code was accepted by English-speaking countries around the world.

Figure 6: This wood and metal portable braillewriter is in the shape of a ruler. It is 13 inches wide by 3 inches high and 3 inches deep. The long side of the braillewriter faces the user, who depresses keys that are on the right hand side. These keys punch holes in a metal grid of braille dot cells.
France Honors Its Native Son

Louis' momentous accomplishments on behalf of blind and visually impaired people were not fully recognized until many years after his death. In 1952, however, one hundred years after his death, Louis Braille's contribution was recognized in France and by the rest of the world. His body was reinterred in Paris in the Pantheon, the resting place of illustrious French men and women such as Voltaire, Zola and Marie Curie. However, Louis' hands were severed from his body and remain in an urn in the village cemetery of Coupvray, and Coupvray named the street where he lived after their famous son.

Helen Keller in Paris

Like all avid readers, Helen Keller recognized the greatness of Louis Braille's contribution to her and other blind people through her writings and speeches. In 1952 Helen was invited to join the centennial celebrations of Louis' birth in Paris. She was given a Medal of Chevalier of the French Legion of Honor and delivered a speech in French honoring the life and legacy of Louis Braille. The speech is translated here:


Mister President, Professors, Ladies and Gentlemen,

I am touched by the honor you have given me. I cannot help thinking that this honor is not due to any accomplishment of mine, but is rather for the encouragement of the blind and the deaf whom I represent.

On behalf of the blind people of the world, I thank you from the bottom of my heart for having generously recognized the pride and efforts of all those who refuse to succumb to their limitations. In our way, we, the blind, are as indebted to Louis Braille as mankind is to Gutenberg. It is true that the dot system is very different from ordinary print, but these raised letters are, under our fingers, precious seeds from which have grown our intellectual harvest. Without the braille dot system, how incomplete and chaotic our education would be! The dismal doors of frustration would shut us out from the untold treasures of literature, philosophy and science. But, like a magic wand, the six dots of Louis Braille have resulted in schools where embossed books, like vessels, can transport us to ports of education, libraries and all the means of expression that assure our independence.
Look at the strong solidarity that is already taking hold among blind people all over the world, and how, thanks to international braille, they have begun to weave words of kinship among themselves and with humanity. This is truly a symbol of all the years in which blind people have broken through the darkness with the inner light of human knowledge. Blind people of the world simply ask that where their abilities have been successfully put to the test, they are given the chance to participate fully in the activities of their sighted counterparts.

Can I tell you, esteemed faculty of the Sorbonne, my heartfelt thoughts? You have shown a generous interest in the well-being of mankind. Above all, you represent France which is always in the forefront of enlightened activity — the country where Louis Braille was born and for whose legacy he worked. How better can we honor his memory than by pursuing the Christian ideal of helping those with disabilities and fostering a public spirit of cooperation that will enable the visually impaired to reach enormous heights of accomplishment and spiritual fulfillment?

Helen Keller

**Figure 7: A close-up of Helen Keller's hands reading braille.**

Taken from [http://www.afb.org/LouisBrailleMuseum/](http://www.afb.org/LouisBrailleMuseum/) on 05/01/2012.
Louis Braille Quiz (1.D.2)

Questions:
1. Where and when was Louis Braille born?
2. How did Louis Braille lose his sight?
3. How did many persons who were blind live during the time that Louis was growing up?
4. What did Louis Braille's parents think he needed in order to become independent?
5. What system did Louis Braille's parents devise to teach him to read and write?
6. What tool did Louis's father invent to allow him to become more independent?
7. How did Louis Braille manage information in his early years of school in his home town?
8. Why did Louis's parents decide to send him away to The Institute for Blind Youth in Paris?
9. What subjects and other lessons did Louis study at the institute?
10. The first books developed for persons who could not see were "embossed letters". Describe embossed letters. How is the braille code better than embossed letters?
11. Captain Barbiert's 12 dot system for communication called "night writing" and "sonography" inspired Louis to develop a different system of raised dots for communication. Why was Braille's system better than sonography?
12. How long did it take Louis to develop and refine his raised-dot code?
13. Describe how Braille's code was organized.
14. After developing the braille Code, what else did Louis Braille invent?
15. When Dufau became Director of the Institute he banned the use of Braille's 6 dot code. Why?
16. Why was the book, titled "A Brief History of France" important?
17. Joseph Guadet supported the use of Louis Braille's code. How did he demonstrate the use of the Code?
18. When and how was braille adopted as the International System used for writing by the blind?
19. When was braille accepted by English-speaking countries around the world?
20. How has Louis Braille been honored for his great contribution to society?
Louis Braille Quiz Answer Sheet (1.D.3)

1. Louis Braille was born on January 4, 1809 in Coupvray, a small village 25 miles east of Paris, France.

2. Louis Braille lost his sight when he was 3 years old by puncturing his right eye when playing with his father's tool. The other eye was infected and his sight deteriorated until he was completely blind by age 5.

3. During Louis Braille's time many blind people in France lived by begging and peddling.

4. Braille's parents were determined that Louis be educated in order to become independent.

5. Louis was taught to read and write by feeling nails hammered into boards in the shapes of letters.

6. Louis's father carved a wooden cane for Louis so that he could navigate his home and village without assistance.

7. Louis had to memorize what he learned when he attended the local school in Coupvray because he had no other way of storing and/or retrieving the information.

8. Louis’s parents realized that he needed special instruction if he was to progress. After much soul-searching, they agreed to send him to the Institute for Blind Youth in Paris. This decision was encouraged by the local priest and a scholarship was arranged by a local nobleman.

9. At the institute, Louis had lessons in Greek, Latin, algebra and French grammar. In addition students were taught practical skills, such as chair caning, making slippers, and basket making.

10. The embossed books for persons without sight were made by creating raised letters on paper by hand with a stylus or with raised type from the back of the paper.

11. The sonograph 12-dot code was very complex and based on the 36 sounds of the French alphabet and did not include spelling or punctuation. Braille code was simple and used a cell of only 6 dots represent letters, numbers, punctuation, and whole words.

12. It took Louis three years of his free time to work out his basic embossed dot system.

13. A full braille cell consists of six raised dots arranged in two parallel columns, each having three dots. Sixty-four combinations are possible using one or more of these six dots. A single cell can represent an alphabet letter, number, punctuation mark, or a whole word.
14. After he developed the braille code, Louis invented decapoint, which used 100 dots in a 10x10 grid. Each letter was based on a dot configuration that could be looked up on a table that he developed. Louis also developed a machine to write decapoint, called the raphigraph.

15. Director Dufau feared that there would be no need to have sighted teachers if everyone who was blind could read by using braille.

16. "A Brief History of France" was the first full-length book that was published in braille.

17. Joseph Guadet supported the use of the braille code. During the dedication ceremony of the institute's new building he read a 15 page book entitled, "Account of a System of Writing in Raised Dots Used for the Blind," which acknowledged Louis Braille's accomplishment of development of the code. Next a child was sent out of the room. Another child used Louis's code to write poetry dictated by a visitor. The first child came back into the room and read the poetry that the first child had written.

18. In 1878, a congress met in Paris and officially adopted braille as the international system used for writing by the blind.

19. It was not until 1932 that the braille uniform code was accepted by English-speaking countries around the world.

20. Louis Braille was honored in several ways.
   a. Joseph Guadet recognized Louis as the developer of the braille code and demonstrated its use at the dedication of the new institute building in 1844.
   b. In 1952, 100 years after his death, Louis Braille was recognized by France and the world. His body was placed in the Pantheon with other illustrious men and women.
   c. See 18 and 19 above.
The Evolution of Braille: Can the Past Help Plan the Future? (1.E.1)

Part One of a three-part article from the
Braille Authority of North America (BANA)
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Introduction

Braille itself has been instrumental in making possible the integration of blind people into society, and, in turn, this increased integration has driven developments in the use and production of braille. The more integrated that blind people have become, the greater are the demands placed on sources of literacy. Are the literacy tools keeping up?

The purpose of this article is to illuminate the changes in the way braille has been produced and used over the past 50 years, and to discuss some of the reasons for and impact of these changes. Clearly there are a number of overarching and complex issues that influence the teaching, learning, and use of braille—teacher shortages, teacher competency, service delivery methods for braille learners, the role of braille in employment, and more. However, this article will focus on the evolution of the communication methods used by braille readers; it will also look at other evolutions that have occurred such as how blind children are educated, the range of available technologies, and the evolution of braille and print.

This article is divided into three parts. Part 1 traces the use of braille as a viable reading medium from the 1960s to the present and takes a close look at how print has changed over the same period. Part 2 discusses the more technical aspects of braille translation, challenges faced by current transcribers of current codes, the need for accurate forward and backward translation with the least amount of human intervention, and the impact of the use of refreshable braille displays. Part 3 discusses the future; it explores the options for change and examines Unified English Braille (UEB) and the Nemeth Uniform Braille System (NUBS) as examples of code unification.

The development of braille and of its use in the United States is a long and fascinating story. The history is well-documented, so it will not be repeated here. This article will begin with a look at the evolution of braille in the United States beginning in the 1960s. First, however, it may be helpful to provide an answer to a frequently asked question: "Print does not change; numbers are numbers, parentheses stay the same, a dollar sign means dollars. So why all the tinkering with our braille?" Let's take a quick tour of the relevant changes that have occurred in print during the last 50 years.
Print Changes

In the early 1960s, print was, believe it or not, quite a different thing from what it is today—not only in terms of its methods of production and distribution, but also in the way it looked. For starters, individuals could produce print either by handwriting or with a mechanical or electric typewriter. Print produced on a typewriter was very symmetrical with rows and columns of characters. The primary tool available for showing emphasis was underlining. In 1961, the first IBM Selectric typewriters had a rotating type-ball that could be changed in mid-document, allowing, for the first time, different fonts in the same document. This meant that individuals could produce a document with bold or italicized text, and they began to do so with abandon. Still, symbols that could be represented by typing were limited. If one wanted to place an accent mark over a letter, such as in the word resume, it had to be done by backspacing over the final e and using an extra keystroke. Multiple copies could only be made using carbon paper or mimeograph machines, and, if a print document could not be hand delivered to its intended recipient, it had to be sent in the mail.

Color and graphics could only be produced by professional printers or publishers using expensive and complex methods, and they were not used in the same way we see today. Classroom textbooks were generally full of text, which was usually meant to be read straight across a column or page.

Beginning in the 1980s, people began to have computers and printers in their homes. At first, the printers created text much as typewriters did—columns and rows. In fact, a common kind of printer at this time was the "daisy wheel" printer, with technology not much ahead of the Selectric typewriter. The daisy wheel had a spinning sunburst of petals, each with a character on its end, and only characters available on that wheel could be printed. Copy machines improved and fax machines became common, so it was easier to reproduce and distribute print documents. Still, although floppy disks computers could be hand delivered or mailed, paper was key in the distribution of print. Print began to show variations of font and style. Creativity abounded, and people were continually looking for ways to make the print appear "more attractive" to readers.

By the 1990s, the world of print was evolving at a tremendous rate. With laser printers, personal computer users were able to print complex text with multiple character sizes and various fonts and styles on a page. It was even possible for a person to create an entirely new print character if the current range of characters did not happen to include what was needed. People liked what they saw, and the vast varieties of possible print continued to expand. Color print was at first quite expensive for individuals to produce, but became more economical with the introduction of the inkjet printer.

As the possibilities have expanded, the nature of print on a page has become more and more non-linear and with an extensive use of graphics. Today, both K12 and higher-education textbooks are full of photographs, diagrams, charts, graphs, boxes, and
sidebars presented for visual appeal, and the content necessary to convey the meaning is displayed in a variety of layouts and arrangements on a page. Because technology is so much a part of the daily life of people of all walks of life, the boundaries between what is "technical material" and what is purely literary are increasingly blurred—web addresses, symbols that stand for letters, and even mathematical equations can frequently be found in everyday books and magazines.

Often, written documents never even make it to paper; rather, they are presented and read using computer screens, cell phones, or other electronic devices specifically meant for on-screen reading. For example, in 2008, the Colorado Community College system announced that students could access all their textbooks online for a flat fee. Online textbooks have the advantage of including hyperlinks, definitions, links to additional information, interactive graphics, and much more. Classroom settings in general are much, much more computer-based. Gone are the days of a teacher writing on a chalk board—the teaching demonstrations, the assignments, even the tests are increasingly conducted in an online forum.

Print conventions have changed. For example, there are now many styles of enclosure symbols like parentheses-brackets, curly braces, and angle brackets. Bulleted lists are ubiquitous. Changing technology has made it easier to change font, color, and print size—even within the same sentence—and brought new words into our language, spelled in new ways with capital letters and periods in the middle of words. Plus signs, dollar signs, trademark and copyright symbols, "@" signs standing for letters, and question marks with spaces on either side run rampant, not just through text messages, but all through everyday magazines and newspapers.

**Braille Changes**

Before the 1960s, blind children were usually educated in completely separate settings from sighted children, mostly in residential schools for the blind. The main source of leisure reading materials in braille was the Library of Congress. Educational materials were brailled mostly by a few braille publishing houses, using human braille transcribers who wrote each and every word of the material into braille; the number of titles that needed to be transcribed was limited by the fact that blind children attended only a relatively few schools. Most of the teachers who worked with blind students knew how to read braille, and, therefore, could comfortably create braille materials and did not need to rely on a print copy to read the students' materials. Print page numbers were not generally shown in braille books. Outside of the braille publishing houses or schools for the blind with access to braille presses, transcribers could only produce braille by hand, either using a Perkins Brailler or a slate and stylus. Multiple copies of a document could be produced only using a thermoform machine, which was an expensive and laborious process.

The literary and the mathematics braille codes had generally been developed and then evolved with an eye toward saving space; for example, in order to use fewer cells, the
percent sign and units of measurement such as "cup" were always brailled before the number, regardless of the order in print. Part of the role of the braille transcriber was to make the judgment calls that were sometimes needed to decide how to transcribe a given symbol. To save space and use less paper, it was common practice to divide words between lines when there was room for part of a word at the end of a line. This practice required time-consuming consultation of a dictionary to ensure that proper division occurred, and saving space and paper was more valued than saving time. The code for rendering mathematics in braille changed several times during the first half of the twentieth century, and, by 1972, the Nemeth Code for Science and Mathematics Notation was the standard.

If a blind person needed to produce something in print, the person either used a manual typewriter, often having written the material in braille first, or dictated the material to a sighted individual, to handwrite or type. Reading braille always meant reading from hard copy—primarily paper but also on thermoform plastic.

Many factors in the blindness field began to change in the 1970s. In the educational arena, Public Law 94-142 provided that blind children should be educated in the "least restrictive environment." An increasing number of blind children had already begun to be educated in the public schools rather than in specialized schools for the blind, and the law accelerated the trend. This shift required many more titles to be transcribed because not every school used the same textbooks, even within the same state, and this led to an increased need for braille transcribers.

The organization responsible for developing the braille code had changed in composition and in name numerous times over the preceding century. In 1976 this group became known as the Braille Authority of North America (BANA), and it included national consumer organizations, braille producers, the Library of Congress, transcribing organizations, and others. While continuing to fine-tune the literary braille code, in the late '70s, BANA developed a system that included print page numbers in braille books so that mainstreamed blind students could follow along with the rest of their print-reading class. The system included additional symbols and formats not covered in the literary code, but needed for the meaningful transcription of textbooks used in mainstreamed classroom settings.

To some extent the braille code moved away from specialized practices, such as inserting apostrophes in braille where none existed in print, and more toward giving the reader an accurate representation of print. Library books, magazines, and the like were still transcribed using the literary code. The textbook code was substantially updated in 1997 and is now known as Braille Formats: Guidelines for Print to Braille Transcription and numerous conflicts between the literary braille code and braille formats still exist today.

Literary braille provides only one way to indicate a change in font showing emphasis. The one indicator, the italic sign, has to represent italic, boldface, underlined, or colored type.
The Formats guidelines allow for italic, boldface, and various colors. These are needed when a textbook gives an instruction such as: "Copy the new vocabulary words (shown in italic type) into your notebook and study the review words (shown in boldface type)."

The literary braille code instructs the transcriber to substitute a word for symbols such as + (the plus sign), - (the minus sign), and < (greater than) that are shown in print. Braille Formats has braille characters to use for many such print symbols. For example, in a sentence such as "John + Mary = True Love," Braille Formats would use symbols similar to but not exactly like those in the Nemeth Code. If, literary braille is followed, words "plus" and "equals" would be used for the print symbols. (Pad two of this article will discuss the conflicts that can arise when symbols from different BANA codes are considered for adoption into literary braille.)

Print textbooks make use of a variety of enclosure symbols, including parentheses, square brackets, curly brackets (also referred to as braces), angle brackets, and enlarged versions of all of these symbols. The literary code only provides for parentheses and square brackets. Braille Formats adds curly braces and angle brackets. In some texts, it is critical for students to know what enclosure symbol is shown in print. Mainstreamed students and employed blind people are expected to be able to produce print similar to that of fellow students or colleagues at work. Their textbooks need to help them prepare for this.

Additionally, to try to ensure greater clarity in the representation of computer-related material that was becoming more prevalent, BANA developed a specific computer braille code. While this made computer programming easier for braille readers, it added a new set of symbols. For even the most casual braille reader of general literary material, symbols from this code abound today in e-mail addresses, web sites, and even the name of common companies such as Amazon.com.

In the 1970s, braille translation software, although still in its infancy, started to become more common, and by the early 1980s, braille embossers were being used by larger organizations. Transcribers could either use six keys on a regular computer to enter the braille by hand or they could insert special codes into a print document to produce the proper formatting. Embossers provided an easier way to make multiple copies, but still, reading braille meant reading hard copy. Electronic braille displays had started to arrive but they were mostly incorporated into stand-alone products that did not interface with mainstream devices, and most people did not have access to them.

In the late 1970s and the 1980s, the typewriter and the dictation method were still the primary methods for a blind person to produce print. However, in the K-12 education setting, the braille-reading students could often write out their assignments in braille, and then the special education teacher or transcriber would "interline" the braille, i.e., write print above the braille so that the classroom teacher could read it. Most blind students who grew up during this era never had the experience of being able to read directly-

1.E.1
written communication from their classmates (no passing messages, no copying class
notes), because most of their classmates were print users who did not know braille. In the
late 1980s, speech output became possible on personal computers, but was far from
commonplace. Blind people with access to this technology could check and edit their own
typing and could share their work by printing it out onto paper. There was still no way to
fill out forms or pay bills without using a human reader, and no way to share documents
without printing them first.

Beginning in the 1990s, the further proliferation of the personal computer and the rise of
the Internet began changing the nature of the interaction of print and braille and
dramatically increasing blind people’s access to written information. Today, all kinds of print-
origin documents are more directly available to braille readers. Now, with various
combinations of Internet media, speech output, braille displays, scanning and OCR, braille
translation software, and braille embossers, blind people can read, in a matter of
moments, virtually anything created by anyone—a pop quiz from a classroom teacher, a
popular new book that just came out in stores yesterday, a web page created by someone
two minutes ago in France. Job applications, registration forms, order forms, and the like
are readily available online, and bill statements are available electronically to everyone.
Blind people are accessing the exact same material, in the exact same format as their
sighted peers. Braille readers utilize technology to render these materials accessible, not
on a sighted reader or transcriber. Of course, human readers are still the most efficient
means of accessing some information, but the need for them is not as great as in times
past. Some online material is inaccessible, but it is now easier than ever for blind people
to have direct access.

Refreshable braille displays have become more adaptable to mainstream computers, and
note-takers with braille displays are common. These devices allow blind people to read
directly what was produced in print by others without the need to emboss onto paper or
have someone transcribe it. The very same files or messages that sighted peers access by
looking at the screen on their computer or device can be accessed by viewing through a
braille display—no other intervention required. Although these displays are quite expensive
now, they are in the hands of more and more braille readers, and there is no doubt that
cheaper production methods will become available. With braille displays, any number of
daily newspapers can be read in braille, no waiting required and no elimination of articles
because of limited space in a braille publication. When surfing the web with a braille
display, blind people can click on a braille cell using a device, and soon there is another
page of braille. Hence, an unprecedented level of access to books of all types in braille is
now available. The Gutenberg Library, Web-Braille; and Bookshare have made tens of
thousands of titles available electronically, and it is now possible to read these books in
braille using the technology available. Additionally, as optical character recognition
technology has improved and the price of scanners has fallen, an electronic version of any
print book is within the braille reader’s grasp even if it is four o’clock in the morning, and
there is no print reader for miles!

1.E.1
The Future Is Now

Today, blind people can communicate in writing with classmates and co-workers with the greatest of ease via e-mail, text message, social media sites, or by simply passing files back and forth using a host of methods. The method of writing is not nearly as tied to the method of reading as it was in the past. For instance, someone can type an e-mail using a device with a refreshable braille display, and the recipient can read it in print on his or her cell phone screen, print it onto paper, etc. Likewise, someone can use a cell phone keypad to enter a text message, and, with the right technology, the recipient can read it in braille. This, of course, means that blind students can now produce assignments for their teachers more independently than ever. They can receive the handouts via e-mail or web page, access them directly in braille, and submit the assignments directly, again via e-mail or web page.

Braille translation software interfaces well with more and more mainstream applications. Braille embossers, now more widely available, can produce reams of paper braille. Because the existing technology makes it possible to produce braille more easily, it is often used in cash-strapped education settings by people who are not necessarily knowledgeable about braille itself. On the other hand, the work of knowledgeable transcribers, still extremely important, can be far more efficient with the use of this technology. Translation software and braille embossers, combined with the ability to scan documents and the availability of electronic source files from publishers, has created the potential to greatly speed the transcription of braille books. Transcribers are now able to invest less time in entering text and more time in preparing the proper structure and format books that will be translated. Greater ease of braille production correlates positively with a greater availability of braille textbooks, even in higher education. Thus, the stage is set for quicker, cheaper braille.

Increased technology has aided braille readers in their methods of braille production as well. Besides using a slate and stylus or a braille typewriter, blind people, too, can use braille translation software with a PC to create braille for embossing. Refreshable display devices allow users to type either in six-key Perkins Brailer style or use a QWERTY keyboard to get either uncontracted or contracted braille.

Rather than being paper-based, braille for work and communication is now mostly electronic-based. Original documents can be copied infinitely, manipulated, and customized. The same file, with a few keystrokes, can render a document in uncontracted, contracted, or partially contracted braille; with print page numbers or without them; on narrow or wide paper; and on paper or on a refreshable braille display.

BANA has continued to make minor changes to the braille codes for time to time, most moving braille toward greater similarity with print. For example, the placement of the percent sign and items of measurement was changed to follow print, and symbols such as the copyright symbol and trademarks symbols were added. These changes are intended to
give the braille reader more accurate information about what is shown in print, and to give the transcriber greater freedom to focus more on issues of formatting the material rather than assuring that each and every word is rendered correctly. Since a human transcriber is not always part of the equation, it becomes increasingly important for our translation software to at least be able to render the words and symbols correctly. That need factors strongly into the code changes as well and will become an increasingly pressing necessity as print continues to evolve. Since its invention in the early nineteenth century braille has remained vital to the literacy of people who are blind, and it continues to thrive despite the predictions of some to the contrary. As we have seen, however, until the last 30 years, people who use braille had relatively little direct interaction with print, and read braille that was delivered in a fairly standard way. Now, braille users generally interact directly with print-origin material on a routine basis, and the boundaries between what is in print and what is in braille are becoming virtually nonexistent. In addition, while print has undergone tremendous changes in appearance, delivery, and conventions, the braille code itself has changed relatively little.

We have painted a bit of a rosy picture here about what is possible in theory today with so much access to braille. However, we should make no mistake about it. There are great challenges as well. In the next installment of this article, we will discuss in more detail the workings of BANA; some of the challenges in today's braille production via braille display, translation software, and human transcriber; and the reasons why maintaining the status quo in braille code development in this country will not be a viable option for much longer if braille is to keep up with our changing written language and remain the primary tool for nonvisual literacy.