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## CHAPTER 15

### BRAILLE: THE WINDOW OF KNOWLEDGE FOR PERSONS WITH VISUAL IMPAIRMENT

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#### **Introduction**

Education is a fundamental human right of every person which has been emphasized in various contexts since the establishment of the United Nations Charter in 1945. The Universal Basic Education (UBE) is one of the approaches of the Federal Government of Nigeria to meet the goals of 'Education for All.' UBE is a programme for all school-age children and for all non-literate adults. The word 'all' means that everyone within the prescribed category is included and should be involved (Obani, 2006). Similarly, The UN Convention on the Rights of Persons with disabilities (UNCRPDs, 2008) recognizes the right of these persons (with reference to those with visual impairment) to education by mandating states parties to undertake appropriate means to take into account the protection and promotion of their human rights in all policies and programme (including education). More so, the education of persons with visual impairment is to be delivered in the most appropriate languages, modes and means of communication for the individual and in environments which maximize their academic and social development (UNCRPDs, 2008). In another development, the Jomtien Education for All, Dakar declaration and more specifically, the Salamanca declaration discussed how broad and balanced special education should be provided for these persons in order to accommodate their needs, abilities and aptitudes (Ozaji, Unachukwu & Kolo, 2016).

Visual impairment refers to any deviation from normal which results in defective functioning, structure or development of the visual organ. The Individuals with Disabilities Education Act (IDEA) (2013) defines visual impairment as vision loss, which adversely affects a child's educational performance. Thus, loss of vision makes it difficult for a child with visual impairment to complete daily tasks without specialized adaptations.

Persons with visual impairment are those whose sense of vision is defective. Persons with visual impairment are individuals with problems in the structure and or functioning of the eye (Lere, Ozegya, & Iroegbu, 2014). These problems range from ability to see a little to inability to see at all. Hence, these persons usually



experience limitations in performing certain actions, functions or educational activities that involve the use of sight (vision).

Abang (2005) describes children with impairment as those whose visual defect interferes with their optimal learning and achievement. Hence, the children cannot benefit from visual information to be able to carry out experiments, observations, measurements and other activities in the teaching and learning process. Thus, they need modification in the method used to present learning experiences, materials and in the learning environment (Ozaji et al, 2016). Similarly, these children need to be trained to use and rely on other senses (auditory, tactile, olfactory and kinesthetic) in order to excel maximally in school. Accommodating them in classrooms involves modification (changing) of teaching methods, materials and instructional strategies without altering the standard of learning and their expected requirements. Also, it involves giving extra time for the individuals to complete tasks, assignments or examinations, breaking up tasks into simple and smaller parts, carrying out individualized teaching, modifying classroom instruction, providing models of objects or real objects in the classrooms, etc. (American Foundation for the Blind, 2018).

These children learn in different ways – some may find it easier to take in information via audio while others prefer to read the written word in Braille. But when it comes to really engaging with a text, particularly complicated printed material, the Braille system is preferred.

Braille is a system of touch reading and writing for persons with visual impairment in which raised dots represent the letter of the alphabet. The ability to read and write Braille provides a window of knowledge to persons with visual impairment as it gives them opportunity to read and use the written language for communication and their educational activities; thus, connecting them to the world of knowledge.

In this chapter the writer considers Braille as the window of knowledge for persons with visual impairment. Therefore, the paper shall be focusing on highlighting and discussing the concept of Braille reading and writing, the place of Braille in the education of children with visual impairment, Braille as a window of knowledge, modern technologies in Braille reading and writing in areas of knowledge e.g., mathematics and music, challenges of Braille reading and writing and finally the implication of the foregoing discussion to advancement of knowledge.

### **Concept of Braille Reading and Writing**

Braille is a system of touch reading and writing for persons with visual impairment in which raised dots represent the letters of the alphabet. It also contains equivalents for punctuation marks and provides symbols to show letter groupings (such as group signs and word signs). It was devised by Louis Braille in 1821 and consists of raised dots arranged in 'cells. Iroegbu (2009) refers to Braille as a tactile reading system based on 63 possible combinations of raised dots



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arranged in a six-dot configuration called 'cell.' A cell is made up of six dots vertically numbered 1-2-3 on the left-hand side and 4-5-6 on the right hand side that fit under the fingertips.

- 1 • •4
- 2 • •5
- 3 • •6

### **A Braille Cell**

Each cell represents a letter, a word, a combination of letters, a numeral or punctuation mark. It can be written either on embossed paper or by using refreshable Braille displays that connect to computers or smart phone devices. There are majorly two types of Braille – text or literary Braille and contracted or alphabetic Braille. The literary Braille consists of two forms – non-contracted or alphabetic Braille and contracted Braille for saving space. Alphabetic Braille, formerly called Grade One, writes on each letter and word exactly as it is spelled out in print; while the Literary Braille (formerly called Grade Two Braille) is contracted (that is written in short forms) in order to save space.

#### **Braille Grades**

Generally, Braille is read and written in grades such as grade 1, grade 1<sup>1/2</sup> and grade 2, grade 3, Braille shorthand and special Braille codes.

**Braille Grade 1:** This is the most elementary form of Braille; though it utilizes the rule of the Standard English Braille System. Here, words are not contracted. Its use is common in Nigeria and other English-speaking countries (Iroegbu, 2010).

**Braille Grade 1<sup>1/2</sup>:** This is a form of contracted Braille because of its use of contractions (shorthand forms of writing in Braille) is to a limited extent compared to grade 2 Braille. It is used mainly in the U.S.A.

**Grade 2 Braille:** This is a highly contracted form of Braille but also to some limited extent. This grade constitutes the official system of Braille in England and English-speaking countries. It is widely used by persons with visual impairment in the primary, post-primary and other institutions of higher learning. Lowenfeld, a veteran visually impaired teacher, in Iroegbu (2010) advocates for this system for Braille readers.

**Grade 3 Braille:** This is an extension of grade grade 2 Braille and it uses many contracted and shorthand form words. It is highly personalized for the convenience of college and university students. This grade permits the students to compete favourably with fellow sighted students when taking down lecture notes in the classroom.

**Braille Shorthand:** This form of Braille consists of highly contracted forms for writing words, phrases and letter combinations that occur frequently in commercial usage. It is used mainly by professionals who are visually impaired such as stenographers in secretarial positions.



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**Special Braille Codes:** These codes exist for the writing of music, mathematics and other scientific formulae, and persons with visual impairment interested in these fields can learn such codes.

**Equipment for writing Braille:**

The following equipment can be used in writing Braille by and for persons with visual impairment including slate (also known as writing frame) and stylus, thermoform duplicator, Braille machine (e.g. Perkins Brailler), electronic Braille writer, and computer Braille embosser.

**Slate and Stylus:** These are plastic or metal frames with openings through which Braille dots are punched with a pointed stylus on a special paper called Braille paper.

**Thermoform duplicator:** This is a duplicating machine for mass production of text, pages and raised (relief) pictures or diagrams on plastic Braille papers called braillon sheet for the consumption of persons with visual impairment.

**Perkins Braille Machine:** This machine is comparable to a typewriter, but has a keyboard of only six keys and space bars (for back and line spacing).

**Electronic Braille Writer:** This produces and translates Braille into text or synthetic speech for persons with visual impairment.

**Computer Braille Embosser:** This is a Braille printer that is usually connected to the computer system to emboss computer generated text as Braille copy on a paper or braillon sheet for the consumption of persons with visual impairment.

### **Reading and Writing of Braille**

Braille reading and writing involve the conventional process of reading and writing by the sighted persons in that before a child or an individual (sighted) could read and write in any language such a child or an individual must have to be exposed to; and must have mastered the letters of the alphabet of that language. There is no language (English, French, Greek, Igbo, Hausa, Yoruba, etc.) without its own letters of the alphabet (Iroegbu, 2010). With this knowledge the child or individual must first and foremost be exposed to letters of the alphabet of any language and then be readily prepared to read or write words, phrases, and sentences in a language. So, the mastery of letters of the alphabet such as the Braille alphabet provides a leeway for any child or individual to read and write Braille.

Braille is 'written' either by hand with a 'stylus' (a bicycle-like thing) on Braille paper, which is usually fixed in a frame or by using Braille machine (e.g., Perkins Brailler) or an embosser connected to a computer system. With the writing frame and stylus, Braille is written from the right hand to the left-hand side and read conventionally from left to the right-hand side as the Braille reader can only make meaning out of the raised dots embossed on the Braille paper. With Perkins Brailler and embosser; Braille is written and read conventionally from left to the right-hand side. Actually, Braille is read tactually by running the tip of the index finger on the raised or embossed dots on the Braille paper from left to the right-



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hand side of the paper (by persons with visual impairment). However, sighted persons can read Braille with their sight.

### **Place of Braille in the Education of Persons with Visual Impairment**

Globally Braille has continued to be the main medium of communication (literacy) to the visually impaired. Irrespective of the fact that social and technological development has caused a steady decline in its usage, Braille has continued to be very important in the personality development of the blind. To this end, Braille occupies a tremendous place and plays a vital role in the life and education of persons with visual impairment such that it is described as a window of knowledge to them. In other words, Braille has opened the gateway of knowledge to persons with visual impairment.

The ability to read well through the Braille system constitutes one of the most valuable skills a person with visual impairment can acquire in order to excel in the world of knowledge. Because, Braille is equivalent to print in that the alphabets, numbers, math and music notations and other symbols that appear in print could be replicated by arranging combinations of the six dots of the Braille “cell.” Braille has been observed to be the best way to develop spelling, grammar and punctuation skills in the visually impaired. Audiotapes and computers that “speak” a text through a voice synthesizer program can provide access to all sorts of written materials, however, they cannot give new readers the tools that they need to read and write for themselves.

Also, complex charts and graphs may be almost impossible to describe well orally to the visually impaired, but they could be clearly communicated in Braille (Iroegbu, 2010). Children with visual impairment need to be literate – to read, write, and count – in order to enjoy intellectual freedom, personal security and equal opportunities when they grow up. In this regard, the children need to be taught Braille, which is “a building block” of literacy. Even though technology could offer these individuals choices, it does not replace the benefits of Braille in every situation. Apart from using Braille to read all kinds of textbooks and documents, it could be useful in various ways. Thus, it could be used at home to label, for instance, CDs, clothes, threads, spices, and cans of food and computer disks. Braille reading and writing is virtually the foundation of education for persons with visual impairment because it gives them greater and better access to school curriculum and knowledge of the seeing world.

### **Braille as a Window of Knowledge**

Braille has indeed created a window of knowledge for persons with visual impairment. Imagine a group of sighted students in a learning setting; the teacher suddenly instructs that students should no longer need to learn how to read and write but that they can watch TV or allow computers to do their work for them instead. This is not practical and would never happen, no matter where the digital era may take us to. The expectation for students to learn to read and write is not

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different for a person with visual impairment. It is fundamental to learn these skills in order to progress. In order for an individual to enjoy intellectual freedom, personal security, and independence and have equal opportunities to study and work, one must be literate. There is no substitute for the ability to read, and therefore no digital alternative that can replace Braille completely for persons with visual impairment (Massof, 2009).

Educationally, a child with visual impairment cannot read printed symbols, but can only read through Braille (Ozaji, 2005). However, a person who reads Braille can roam independently among the community as Braille increases in showing up everywhere. With the Convention on the Rights of Persons with Disabilities implementation in 2008, over 150 countries have signed the ratification (Index Braille, 2022). Hence, the declaration has introduced the recognition of persons with visual impairment on equal basis with others worldwide. Additionally, society is beginning to recognize the need to present equality for all citizens within its communities; therefore, public spaces continue to present tools and aids for those with visual impairment. For example, you might see Braille in many occupancies including elevators, airplanes, restaurants, bank notes, etc. (Index Braille, 2022).

Braille is used in everyday communication by literate persons with visual impairment and as such these persons can now enjoy independence and privacy. Speech feedback or other digital tools are no compensation for Braille, because listening alone is not enough for knowledge acquisition. To read without Braille means that a person with visual impairment will have to be entirely dependent on computers with voice synthesizers or audio recording. However, neither of these is useful in every circumstance. Therefore, Braille has brought sight to persons with visual impairment and opened the window of knowledge for them to thrive in the seeing world. Assistive Braille Technology such as a Braille tablet-like device now allows persons with visual impairment users to access various functions including word processing, e-book reading, web browsing, social networks, voice recording and e-mail using Braille and speech. Also, there are available and affordable assistive technologies (ATs) such screen readers, speech recognition software and refreshable Braille displays (electro-mechanical devices for displaying Braille characters) for the consumption of persons with visual impairment in the market today.

### **Modern Technologies in Braille Reading and Writing in Advancement of Knowledge**

The advances in Braille technology are meaningful because persons with visual impairment can access more texts, books and libraries. Braille technology is assistive technology, which allows persons with visual impairment to do common tasks such as writing, browsing the internet, typing to Braille and printing in text, engaging in chat, downloading files, music, using electronic math, burning music and reading documents (Royal National Institute for the Blind, 2022).



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Technological developments have made Braille far more usable for persons with visual impairment. Apart from making it easier to convert; it also makes Braille far more portable. A whole Braille book can now be stored on a small disk or memory stick, rather than taking up reams of paper and shelves of storage space.

Developments in technology mean that it is cheaper to read through a computer using screen readers or audio files rather than Braille. However, this does not replace the need for Braille; in the same way that using computers has not replaced the need for us to learn to write by hand. Just as it is said that speech is for speed; Braille is for accuracy because it can provide layout information more efficiently than any audio device. Also, with Braille it is easier to spot things like spelling mistakes when reading Braille than it is to hear mispronunciations amongst a lot of speech (Massof, 2009).

Advancement in assistive Braille technology has brought in the existence of certain assistive devices such screen readers, speech recognition software, refreshable Braille displays and touch and hear assistive teaching system (a digital encyclopedia for persons with visual impairment, with images and audio tracks) in order to enable to improve educational process for persons with visual impairment.

### **Challenges**

With the majority of English-speaking International Council on English Braille (ICEB) member-countries having officially adopted Unified English Braille (UEB), there remain barriers (National Braille Authority, 2013) to implementation and deployment. In addition to International Council English Braille member-nations, there are also many other countries with persons with visual impairment that teach and use English such as India, Hong Kong, China, Pakistan, the Philippines and so on. According to Braille Association of Northern America (BANA, 2014), many countries use the non-Unified English Braille math notation, for English-speaking countries specifically, and versions of the Nemeth Code were widespread by 1990 in the United States, Western Samoa, and Canada; whereas some countries (like Iran and Saudi Arabia) in the Middle East used Nemeth and Taylor math-notations as of 1990.

As of 2013, it is unclear whether the English-using visually impaired populations of various ICEB and non-ICEB nations will move to adopt the UEB and if so, at what rate? Beyond the official adoption rates in schools and by individuals, there are other difficulties. The vast majority of existing Braille materials both printed and electronic is in non-Unified English Braille encodings (National Braille Authority, 2013). Furthermore, other technologies that compete with Braille such as screen readers for electronic text-to-speech, plus physical pages to electronic text software combined with high-resolution digital cameras and high-speed document scanners are now ever-more-widely affordable besides the increasing ubiquity of tablets, smart phones, personal digital assistants (PDAs), personal computers (PCs). In fact, the percentage of persons with visual impairment who are literate in Braille is already declining – and even those who know the electronic system tend

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not to know the Unified English Braille (UEB), since that system is still very new. Yet, as of 2012 many of the original goals for UEB have already been accomplished, some of which include:

- A unified literary code across most English-speaking countries.
- Number of coding subsystems reduced from five major and one minor down to two major and two minor (National Braille Authority, 2013), plus the generality of the basic UEB literary was increased to fully cover parentheses, math-symbols, emails and websites (BANA, 2014).
- Reason level of backward compatibility with the American style of English Braille.
- Making Braille more computer friendly, especially in terms of translation and back translation of the encoding system (National Braille Authority, 2013).
- Fully extensive encoding system, where new symbols can be added without causing conflicts or requiring coding overhauls. However, not all the symbols were eliminated (there are still at least two representations of the \$ symbol for instance improper synthesis. Since there are still two major coding systems for math notation and other technical or scientific writing (Nemeth as an option in the United States versus Taylor-style math-notation recently added 30 to UEB literary that will likely be used in other countries), some rule conflicts remain, and Braille users will be required to ‘unlearn’ certain rules when switching. In the long run, whether these accomplishments will translate into broader goals of reducing community fragmentation among English-speaking Braille users, and boost the acquisition speed of reading/writing/teaching skill in the use of Braille and thereby preserve Braille’s status as a useful writing system for the visually impaired remains to be seen. Nevertheless, the ability to read and write provides persons with visual impairment a window of knowledge of the seeing world.

### **Implications to Advancement of Knowledge**

Literacy – the ability to read and write is vital to a successful education, career and quality of life in today’s world. Whether in the form of curling up with a good book, jotting down a phone number, making a shopping list or using a computer to write a report, being literate means participating effectively at home and/or school. However, learning to read and write in traditional ways may not be possible when one cannot see print on a page, there are many other paths to becoming literate. Learning to read and write in Braille can make a dramatic difference in the life of a person with visual impairment whether the person is a child or an adult (American Foundation for the Blind, 2022).

Braille is an irreplaceable and modern method for literacy for persons with visual impairment (Massof, 2009). When you first touch something written in Braille, it will probably feel like a jumble of dots. However, like any other code, Braille is based on a logical system. Once you understand it, you will be able to read and write Braille easily. That is because it is not a language; it is just another way

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to read and write English or any other language such as Igbo or Hausa. Learning to read and write can be challenging and in every situation takes time and practice. This is true of persons with visual impairment. Therefore, families and teachers of persons with visual impairment should support and encourage them so that they become good Braille users. However, Braille doesn't have to be difficult to learn, especially if the individual is young. Therefore, it is never too early to begin to teach Braille to children with visual impairment. In other words, Braille should be introduced to children with visual impairment as early in life as possible. Learning Braille early supplies the individual with more options.

Braille literacy is directly correlated with academic and employment of persons with visual impairment as a matter of fact this is especially true in comparison to those who otherwise rely on voice synthesizers (Mssof, 2009). Therefore, Braille must be included in the unique curriculum for children with visual impairment in schools, because to gain access to the core curriculum a learner with visual impairment will need the unique curriculum. In addition, all of the advancement in modern technologies is geared towards enhancing and ensuring equal educational opportunities for persons with visual impairment in their respective societies.

## **Conclusion**

The development of Braille reading and writing ability in children with visual impairment as a baseline for his/her other educational endeavours is a valuable curriculum content that must not be neglected in the education of persons with visual impairment. At school, children with visual impairment can take notes using a writing frame and stylus, scan a text to find the part to study and proofread it as assignments before handing them in. Children may look things up and go back and forth in the text more easily. Therefore, children with visual impairment who are denied Braille are denied an equal opportunity to be literate.

Braille represents to the visually impaired what the printed word does to the sighted - access to information and contact with the seeing world. In addition to the fact that Braille is the key that opens the door to literacy. It is therefore, a window of knowledge for persons with visual impairment in that through the Braille system persons with visual impairment are recognized as individuals with feelings, desires and aspirations like their sighted counterparts. Literacy equips one with the ability to communicate one's own ideas, opinions and needs. Despite the increased accessibility to low and high-tech assistive devices, Braille has remained the basic means of conceptualizing spellings, sentences, paragraphs, punctuation, numerical configurations and presentation of simple diagrams, charts, tables and graphs in tactile form by persons with visual impairment. There are various tools that can enable a person with visual impairment to obtain, store, retrieve and communicate information. Unfortunately, not all of these tools could enable these persons to learn how to spell or how a printed page appears. These elements of literacy are fundamental to the ability of the person with visual impairment to

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communicate well with others, which have been made possible by the Braille system.

### **Suggestions**

1. The Braille code can be adapted and used in other disciplines like music and mathematics and the major foreign and local languages (Hausa, Igbo and Yoruba). However, it should be noted that Braille is not a universal language.
2. The knowledge of the Braille system should be made compulsory for those interested in teaching persons with visual impairment and those who would want to develop Braille codes for any of the Nigerian languages. While doing this, a word of caution is that the local Nigerian languages are “living languages” and as they are developed, so must their Braille codes. Hence, those who wish to develop its Braille codes must be read to accommodate changes.
3. Teacher education that prepares teachers for learners with visual impairment should emphasize the importance of Braille and ensure that adequate instruction in Braille literacy is provided.
4. The Unified English Braille Code (UEBC) should be introduced and taught in Nigerian schools in order to enable Nigerian citizens who have visual impairment keep abreast of the global competitiveness in the world of knowledge in the 21<sup>st</sup> century.
5. Parents and teachers should support and encourage children with visual impairment at home and in school to learn to read and write Braille in the midst of other options to attain the level of literacy that the children might have at their disposal.



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