

Braille Learning Program-Draft Research Report

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Introduction

Persons with visual impairment face significant barriers in learning and interacting with written/print material, limiting their opportunities for academic success and personal growth. Learning Braille is essential to their development and independence. As a tactile writing system, Braille empowers children by providing access to education. Braille not only enables access to textbooks, literature, and everyday information, but scholarly research indicates that it fosters a sense of autonomy and self-confidence, helping children navigate the world on equal footing with their sighted peers. Mastering Braille is not just about literacy—it's about opening doors to a world of possibilities, ensuring that blind children can thrive socially, academically, and professionally as they grow.

Children with visual impairment start to learn Braille in Grade 1 at special schools. Before they can successfully learn Braille, they need to develop a set of pre-Braille skills such as Tactile Discrimination and Fine Motor Skills, which help them to build finger strength and dexterity. These skills are critical for building the sensory awareness and cognitive abilities that help children in developing Braille reading and writing skills. Following this period, learners start with Grade 1 Braille which consists of the basic alphabet, numbers, and punctuation, making it ideal for simple texts and basic literacy. Then the students are introduced to Grade 2 Braille which uses contractions to represent words or common alphabet combinations which makes reading efficient. In India, children learn the Braille script for their local language, Hindi and English. Besides, the Nemeth Code which is a specific set of Braille symbols to represent mathematical operators, fractions, exponents, and other scientific symbols is introduced in middle school. Mastery of Braille has been seen to take almost the entire school duration for children with visual impairment in India.

Prior field research at Vision Empower indicates that lack of adequate reading material and support in inculcating good reading habits has contributed to a gap in the reading skills of persons with visual impairment. Vision Empower launched a Braille Reading Enhancement program - BiBEK, Books in Braille for Education and Knowledge to enable school going children to get access to adequate reading material and eventually read at par with their sighted peers reading text in print. The program leverages the Hexis-Antara solution, designed in-house and now manufactured and sold by Vembi Technologies, an assistive technology company co-founded by the founders of VE. Our research however shows that the reading abilities of children within a class vary considerably. Arriving at a grade appropriate reading content in Braille has therefore been a challenge. An added disadvantage in schools is that sighted teachers of children with visual impairment are not Braille literate - at least not enough to inspire them to read better and more.

Vision Empower therefore launched a research pilot project to introduce Braille to early childhood learners as a script for reading writing in English to learn at the same pace as a child without visual impairment. The Hexis-Antara electronic refreshable Braille solution was

leveraged to design the learning program. The pedagogic approach is informed by scholarly literature on learning methods, learning content developed by experts in the field, such as The Xavier's Resource Center for the Visually Challenged, Mumbai (XRCVC) and mentorship from experts in children's learning and literacy in India. The short-term output of this research is a brief fun filled curriculum which covers the content and process of introductory Braille.

The Braille Script

Braille is a tactile writing and reading system used by people who are blind or visually impaired. It represents letters, numbers, punctuation, and symbols through patterns of raised dots that are read with the fingertips. Braille is a code that represents written languages such as English, Hindi, Tamil, and has dot representation for mathematics and science notations.

The Braille Cell

The foundation of Braille is the six-dot Braille cell, arranged in two vertical columns of three dots each. The dots are conventionally numbered from top to bottom:

- **Left column:** dots 1, 2, 3
- **Right column:** dots 4, 5, 6

By raising different combinations of these six dots, Braille can produce **63 distinct patterns** (excluding the blank cell).

English Braille Dots

In English Braille, the alphabet is introduced systematically:

- Letters A–J use only the top four dots (1, 2, 4, 5).
- Letters K–T repeat the A–J patterns with dot 3 added.
- Letters U–Z repeat the A–J patterns with dot 6 added (with the exception of W, which was added later to the French-based system).

Numbers in English Braille use the same dot patterns as A–J, but are preceded by a number sign (dots 3-4-5-6). Punctuation marks, capitalization, and formatting (such as italics or emphasis) are also represented through specific dot combinations and prefix signs.

Levels (Grades) of Braille

Braille literacy is typically defined worldwide in three levels (or grades):

Grade 1 Braille (Uncontracted Braille)

This is the most basic level, where each printed letter corresponds to one Braille cell. Grade 1 is commonly used for:

- Beginning readers
- Teaching the Braille alphabet
- Labels, signs, and short texts

It emphasizes accuracy, letter recognition, and tactile discrimination. All Indian languages are represented using Grade 1 Braille.

Grade 2 Braille (Contracted Braille)

Grade 2 introduces contractions, where common words or letter groups are represented by single Braille cells. For example, frequently used words like *and*, *for*, or *the* have their own symbols.

This level:

- Reduces space on the page
- Increases reading speed and efficiency
- Is the standard for most books and educational materials in English

Grade 3 Braille

Grade 3 is not standardized and includes personal or informal shorthand. It is rarely used in formal education or publishing.

Nemeth Code and Other Specialized Braille Codes

While English Braille is used for general reading and writing, specialized codes exist for specific subjects.

The Nemeth Code is used for mathematics and science. It allows precise representation of:

- Numbers and operations
- Fractions, algebra, geometry
- Calculus, chemistry, and physics notation

Nemeth Code uses different rules from literary Braille so that complex mathematical expressions can be read tactually with clarity and accuracy.

Other specialized systems include:

- Music Braille for musical notation
- Computer Braille Code for programming and technical text

- Unified English Braille (UEB), which integrates literary and technical notation (excluding higher-level math, where Nemeth may still be preferred)

Thus, the Braille script is a systematic, logical, and highly adaptable tactile code that enables full literacy for people with visual impairments. Understanding the dot structure, the progression from Grade 1 to Grade 2, and the role of specialized codes like Nemeth is essential for educators, parents, and learners. When introduced through strong pre-Braille foundations and meaningful instruction, Braille becomes a powerful tool for independent reading, writing, learning, and lifelong access to education.

Figure 1: The Braille Cell with positions marked

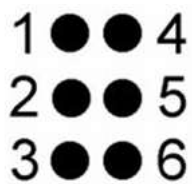


Figure 2: English Braille Script

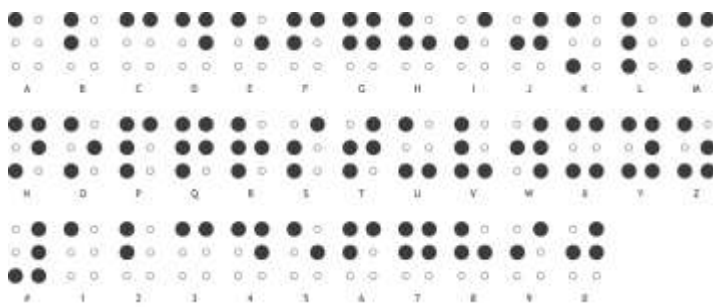


Figure 3: Traditional Tools for Learning Braille – Braille Slate and Stylus

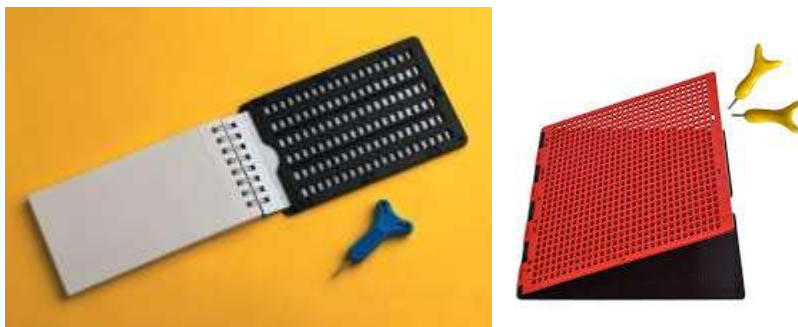


Figure 4: Writing on Braille Paper

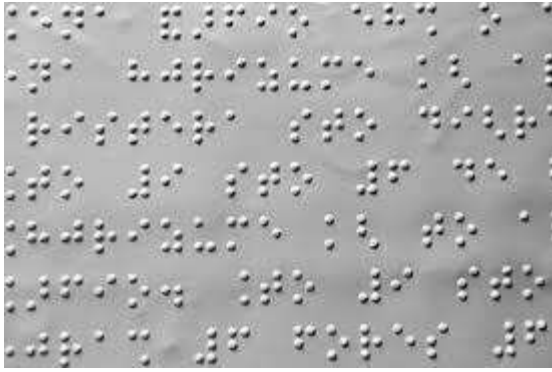


Figure 5: How VI read Braille (Source – Perkins School of the Blind)

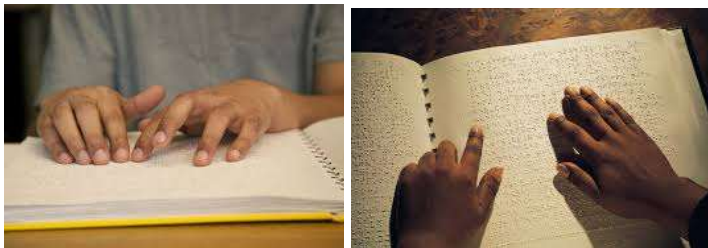


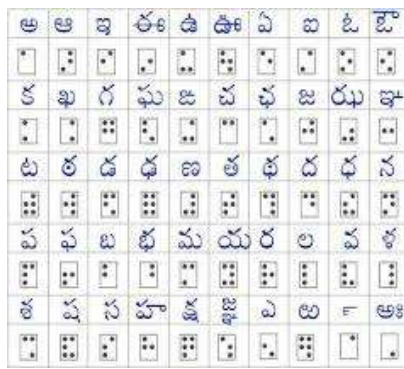
Figure 6: Writing Braille using Braille Slate and Stylus



Indian Regional Language Braille Code

Braille for Indian languages follows a unified and systematic framework known as Bharati Braille. Bharati Braille is designed to represent multiple Indian scripts using a common logical structure, while still preserving the linguistic features of each language. This unified approach allows learners to transfer Braille literacy skills across Indian languages more easily and supports multilingual education for students with visual impairments. Bharati Braille is based on the standard six-dot Braille cell, using combinations of raised dots to represent vowels, consonants, vowel modifiers (matras), numerals, and punctuation. Unlike English Braille, which is alphabet-based, languages such as Kannada and Telugu are abugida (alphasyllabic) languages, where consonants inherently include a vowel sound (usually /a/).

Figure 7 : Regional language script – Kannada/ Telugu



Importance of Braille Literacy for the Visually Impaired

Braille literacy plays a critical role in the educational, social, and economic empowerment of persons with visual impairment. While assistive technologies such as screen readers and audiobooks have expanded access to information, Braille remains the only medium that enables true reading and writing literacy for individuals who are blind. Literacy is not merely the ability to consume information; it is the ability to decode, comprehend, spell, write, edit, and think critically, all of which are fundamentally supported by Braille.

At its core, Braille literacy supports language development and cognitive growth. Children who learn Braille develop a concrete understanding of how language is structured—letters form words, words form sentences, and sentences convey meaning. This mirrors the experience of print literacy for sighted children. Research and classroom practice consistently show that children who rely only on audio input may develop listening skills, but often struggle with spelling, grammar, punctuation, and sentence construction. Braille provides direct access to these structural elements of language, strengthening academic performance across subjects.

Braille literacy is also closely linked to educational achievement and independence. Students who are proficient Braille readers are better equipped to access textbooks, take notes, complete written assignments, and engage meaningfully in assessments. In subjects such as mathematics, science, and computer studies, Braille allows learners to analyze symbols, equations, layouts, and formats in ways that audio alone cannot adequately convey. Specialized Braille codes further enable access to advanced academic content, ensuring that visual impairment does not become a barrier to intellectual growth.

Beyond academics, Braille is essential for functional literacy and daily living. Reading labels, medication instructions, elevator buttons, room numbers, personal calendars, and bank documents empowers individuals to navigate their environments independently and safely. This independence positively impacts self-confidence, decision-making, and quality of life. When individuals can read and write privately without relying on others, they gain dignity and control over their personal information.

Braille literacy is also strongly connected to employment and economic inclusion. Studies across countries indicate that adults who are proficient in Braille have higher employment rates than those who rely solely on audio-based access. Many professions require strong reading, writing, and organizational skills—emails, reports, coding, accounting, teaching, and administration—all of which are supported by Braille. Employers value employees who can work independently and accurately, and Braille literacy enables this level of competence.

Importantly, Braille literacy contributes to social inclusion and lifelong learning. Reading for pleasure, engaging with literature, poetry, religious texts, or personal journals fosters emotional well-being and cultural participation. Braille allows individuals to learn at their own pace, revisit information, annotate texts, and reflect deeply—experiences that are difficult to replicate through auditory means alone.

In conclusion, Braille literacy is not optional or outdated; it is a foundational right for persons with visual impairment. While technology enhances access, Braille ensures true literacy, independence, academic success, and equal participation in society. Investing in early Braille instruction, strong pre-Braille foundations, and trained educators is essential to unlocking the full potential of learners with visual impairment and ensuring inclusive, equitable education for all.

Research Objectives

The primary research question that was pursued in this research was:

Q1: Acknowledging the importance of Braille Literacy for the Visually Impaired children, how should we introduce Braille Script in a fun-filled manner to young children to maximize quick grasp of the script itself.

Q2: How can Braille Script literacy be integrated with language literacy so that they can appreciate and enjoy reading, writing, and expressing themselves fluently and confidently in language of their choice

Q3: What role can Assistive Technologies play to help young learners learn the Braille Script and the language effectively

With these broad questions, the team comprising of members from CAGS and Vision Empower identified the sub-questions and steps ahead to prepare the curriculum for foundational Braille Script and Language learning.

Sub-Questions

What are the various Pre Braille skills in practice today

What assessment about their tactile sense/ fine motor skills should be done

How can their tactile senses be strengthened to make Braille reading and writing better

What are the cognitive skills needed for Braille Reading and Writing

What have been the traditional practices to teach Braille

What are the first five lessons of English Braille Learning
What language Braille is introduced
When does English Braille get started for non native English learners
What is the order of teaching alphabets
What are the tactile teaching materials used for teaching Braille
How are each used. How many classes or duration are required for this.
How is Phonics introduced
What is the approach of Peer assisted learning. Is it practiced in India. How
What are the Braille Learning Apps and Software available in India.
How are they used
How are Refreshable Braille Displays are integrated in Braille Learning
How are auditory clues used for Braille learning
What are the first set of 10 words that they are taught
When does Braille writing get started. What are the steps
Is Braille writing used in conjunction with reading as well
How do children practice reading.
How do teachers monitor their reading and correct them
How do children practice writing
How do teachers monitor the writing and correct them
Is there enough age appropriate content in Braille for reading
What are all the Braille Reading Programs that are available till now
If a child's mother tongue is not English, what is the prevalent way to introduce English Braille
What are the practical issues in reading better in Braille
What are the practical issues in writing better Braille
If a child is late blind, is their process different to learn Braille

Research Design and Methods

The first decision that had to be taken in this research was which language is to be introduced to the children – English or Kannada. First, the project team did not have significant Kannada knowledge. Secondly, English proficiency among children was poor all over. Thirdly, the research pilot could be conducted in one of the states where schools were open during summer. Hence, it was decided to prepare the curriculum for the introduction of English through Braille in the first phase.

Also, while we wanted to develop curriculum for both young learners and sighted adults for learning Braille, the work for the students who are primary beneficiaries of VE, was prioritized in the first phase.

The following methods were adopted by us for the research:

- a) Semi-formal Interviews with Visually Impaired people, including teachers of Braille as well.

- b) Secondary research
- c) Primary field work with the students to understand the utility and effectiveness of the lesson plans developed
- d) Exploration of alternate methods or best practices in teaching languages and Braille worldwide apart from the traditional practices followed by the teachers presently

Need for strengthening Braille Literacy

From our experiences at Vision Empower, we find that:

- a) Braille teaching curriculum exists from various sources, but has not reached teachers effectively
- b) Not all teachers are equipped with methods to teach Braille to the students. Braille is taught by special educators and the subject teachers may or may not know Braille to include reading/ writing during their classes.
- c) Students who are introduced Braille at an early age seem to pick it up very well and grow up to be fast readers with good command over language given good resources and sustained reading.
- d) Pre-Braille activities are under-implemented, not entirely absent. Yet, the teachers may lack structured modules, step-by-step progression, or confidence in tactile teaching
- e) Braille period is usually separated from the other subject periods and hence the children do not immediately start using the Braille Skills that they pick up and read the books regularly.
- f) Children who are late blind find it difficult to pick up Braille in some cases
- g) Some children may be audio learners and not develop proficiency in reading Braille
- h) Fun-based activities are not available or used to introduce Braille typically
- i) The introduction of English Braille and regional language Braille may happen separately by different teachers with different approaches to Braille teaching.

One of the research team mentors who is VI by birth, described her process of learning Braille as follows:

“I started learning Braille when I joined the special school at the age of 5. Braille was taught step by step. Teachers were patient, and used to motivate them. Now, sighted schools attempting to integrate VI students depend on audio materials and do not teach braille. At a certain age, the urge to learn is present, and the skills to build braille skills can not or may not be possible once they are adults.

I first learnt pre Braille skills and then learnt Braille. First, they taught me beside, before, above, and below; they taught me lines first - straight, horizontal, vertical. They didn't tell us rows and columns. They taught us like this: This is 1, 2 comes below 1, 3 comes below 2. Somehow they made us understand straight line. And that the cross line is opposite to this straight line. Using marbles or other objects, they made us know the position of the marble/object and where it is kept. This was done to make us know the position of dots, before we began learning about braille dots. They started with 1 marble, then 2.. and so on. They showed multiple combinations by positioning the marbles in places from 1 to 6 (as shown in the diagram above). She (the teacher) began using 1 marble, then 2, then gradually adding marbles up until 6. She showed us all possible combinations the marbles can be placed in and asked us to place them in the same way. She used to bring 4-5 sets of marbles, give 1 to each student for practice, along with 6 marbles/objects. Then she asked us how many she had placed, where all she had placed it, and she asked them to notice it and keep theirs in the same way. It was like a game. Whoever finished first and did it correctly, would be the winner. Then she used to make others clap for the winner in the class. We (interviewee) also do this in the present, we do it in the same way (praising and encouraging).”

The Braille literacy that she acquired in the early days helped her immensely. Regarding her qualifications and career, she says:

“I teach. I taught in the blind school I studied in after completing my postgraduation and B.Ed. I gave the NET exam and became a lecturer in a college. For voluntary service, I would teach at the school I studied. I taught Braille, Maths, Social, and Science. After Joining Vision Empower, I have been working as a school coordinator to teach teachers and students.”

The above method of learning can be contrasted with another VI person’s experience captured below:

“I learned in a school in Indiranagar and was directly introduced to the braille slate (that has cells or holes) and learned to insert paper and use the stylus. Before this school, I was studying in JP Nagar in a special school. There, I was introduced to beads. I learned to count beads there. I was 4-5 years old then. I was taught directions- up, down, left, right. The teacher held my hand, gave me a slate, and verbally gave me instructions. I was taught how to use a slate. Learning directions was confusing for me. I struggled particularly when the activity given was to stretch hands and place/position left or right hand. It took me one week to learn. I learned just by practice, constantly. There was one teacher who showed that there should be a gap when using the paper in the slate. That was unique, and I didn't need more explanation. The other teachers essentially focused on A-Z and that it should be learned by heart. Only then we can read and write.”

The above two responses to the questions about their Braille journey in childhood show the varied practices followed by the schools. This research attempts to layout an approach that

brings together a fun-based consistent approach that can be rolled out in all schools for teaching Braille to the young learners.

Braille learning for young beginners- A holistic and Ludic Framework for Accessibility approach

Braille learning is the beginning of a skill-building activity that is very important for the Visually Impaired. It should also be joyous for the young, eager learners who are looking forward to learning and understanding the script as a way to enter the world of books and literature.

From the research work, several additional preparatory skills were identified that had to be taught before teaching Braille. Also many best practices were identified from the interviews with experts and teachers that can help in the learning of Braille. These are presented below:

- a) Pre-Braille Foundational Skills
- b) Early Braille Literacy

In recommending the resources and processes for the above two broad categories of activities, alternate pedagogical approaches for teaching Braille were investigated. Two approaches that were relevant have been incorporated in the lessons – Multisensory approach/ learning and peer-assisted learning methods.

Multisensory approach/learning : Multisensory learning is an instructional approach that deliberately engages more than one sense—such as touch, hearing, movement, smell, and residual vision—to support understanding and memory. While multisensory methods are often used as enrichment in general education, for learners with visual impairment they are not optional but essential. When vision is limited or absent, learning must be mediated through other sensory channels to enable meaningful access to information, concepts, and experiences.

Research consistently supports the effectiveness of multisensory instruction, particularly for learners who struggle with reading and comprehension. Studies from the National Institute of Child Health and Human Development in the United States have shown that multisensory teaching is especially effective for children with reading difficulties. For visually impaired learners, multisensory learning primarily relies on tactile, auditory, and olfactory inputs, enabling them to compensate for reduced visual input and construct robust mental representations.

Several case studies across disciplines and contexts illustrate the value of multisensory approaches. In West Bengal, a study on teaching botany—a traditionally visual subject—to visually impaired middle school students demonstrated that multisensory instruction

significantly enhanced learning outcomes. Students taught through tactile exploration of plant structures and olfactory cues gained confidence, developed curiosity about nature, and demonstrated better understanding of botanical concepts compared to those taught through conventional methods. This study highlights how multisensory approaches empower visually impaired learners to actively explore and interpret the natural world.

Multisensory design has also been applied effectively in learning environments. The Pattaya Redemptorist School for the Blind in Thailand, internationally recognised for its design, exemplifies how architecture itself can become a teaching tool. The school integrates touch, sound, temperature, and residual vision through tactile walls and floors, acoustically responsive ceilings, colour contrasts, and ventilation systems that allow students to experience heat and airflow. Such environments support orientation, engagement, and independence, while preparing students for real-world navigation beyond the classroom.

Beyond touch and hearing, research highlights the importance of smell and taste in learning. Studies indicate that visually impaired individuals often use olfaction to distinguish objects with similar shapes and textures, such as fruits. Olfactory cues are also strongly linked to memory, making them powerful learning aids. Research by Jung Dong Cho and others has shown that structured multisensory frameworks—incorporating tactile, auditory, and olfactory displays—can significantly enhance learning outcomes for visually impaired learners. Materials that provide rich tactile feedback, such as clay, wood, and stone, are particularly effective, as they stimulate sensory perception more deeply than smooth industrial materials.

Multisensory learning has also proven beneficial beyond visual impairment, reinforcing its broader educational value. Studies on sensory gardens for autistic learners demonstrate improvements in language, communication, behaviour, attention, and social interaction when learners engage with outdoor environments rich in tactile, auditory, and olfactory stimuli. Similarly, a multisensory literacy programme conducted in a Greek preschool showed that children retained letter knowledge and sounds more effectively when they actively manipulated tactile materials and combined touch with verbalisation, compared to traditional teacher-led instruction.

In conclusion, multisensory learning is a well-established global strategy, but its impact is particularly transformative in inclusive education. For visually impaired learners, it enables access, independence, and deeper understanding by leveraging the full range of human sensory capacities. While countries such as Malaysia and Indonesia have made notable progress in adopting multisensory approaches in special education, India has yet to integrate these practices systematically. Embracing multisensory learning holds significant potential to enhance literacy, confidence, and life skills among India's visually impaired student population.

In the following sections, some activities are presented that are multi-sensory in nature according to these recommendations. Kinesthetic techniques make Braille learning more engaging, memorable, and accessible for VI students. By combining movement, touch, and creativity, we can create a dynamic learning experience that supports Braille literacy development effectively.

Peer Assisted Learning: Peer Assisted Learning (PAL) is a globally recognised pedagogical approach in which students support each other's learning by taking on the roles of tutor and learner. At its core, PAL strengthens understanding through explanation, discussion, and shared problem-solving. Research consistently shows that this reciprocal process benefits both the tutor and the tutee by improving retention, conceptual clarity, and engagement. Beyond academic gains, PAL also nurtures collaborative learning communities and enhances learner confidence, motivation, and communication skills. International evidence strongly supports the effectiveness of PAL. A notable three-year study conducted by the Technological University Dublin demonstrated the positive impact of structured PAL initiatives, particularly for mature learners. The study used an evidence-based framework built around the four "C's" of PAL—Create, Cultivate, Congregate, and Consolidate—to guide implementation. Outcomes included improved experiential learning, increased confidence, and deeper understanding of abstract concepts such as programming languages. PAL has also been widely adopted in professional fields such as healthcare, where it contributes to improved social and professional competencies. However, literature also highlights challenges, including poorly trained peer tutors, unequal knowledge levels, and interpersonal incompatibilities, which can lead to negative learning experiences if PAL is not carefully planned and supported.

In the Indian context, PAL has growing relevance due to the scale and constraints of the education system. India's school education sector serves nearly 25 crore students across over 14 lakh schools, supported by close to one crore teachers. Many public schools remain underfunded and struggle to adopt innovative pedagogical practices. Maintaining an ideal pupil-teacher ratio below 30:1, as envisioned in national policy, remains a significant challenge. In this environment, PAL has emerged as a valuable supplementary strategy to support teaching-learning processes without relying solely on additional teacher resources. Data from UDISE+ (2021–2022) indicate that peer learning is increasingly being adopted in Indian schools, with an average implementation rate of 33.5% and states such as Kerala, Lakshadweep, and Madhya Pradesh leading the way. Although research specific to India is limited, available studies suggest that students value peer learning, experience reduced academic anxiety, and benefit from group-based discussion and support.

PAL in India takes several structured forms. These include class-wide peer tutoring, where students alternate roles within groups; same-age peer-assisted learning, pairing learners of similar abilities; and cross-age peer tutoring, where older students mentor younger ones. Variants such as collaborative learning, study groups, peer feedback, online peer learning,

jigsaw methods, reciprocal teaching, buddy systems, and mentorship programmes further extend the PAL framework. PAL holds particular importance in Indian special schools, especially for learners with visual impairment. Census data indicate a substantial population of children with disabilities, with visual impairment forming a significant subgroup. Resource constraints in special schools are often more severe than in mainstream settings, making PAL a practical and impactful approach. Trained peer tutoring—often involving sighted peers supporting visually impaired learners—has been widely used, though frequently in informal ways. Research emphasises that peer tutoring must be structured, monitored, and thoughtfully planned rather than left to ad hoc arrangements. Cooperative and collaborative learning approaches also show promise by leveraging diverse learner abilities within the classroom. Additionally, integrated models that combine regular teachers with special resource teachers offer strong support for inclusion, though these remain feasible mainly in resource-rich contexts. Overall, PAL emerges as a flexible, cost-effective, and human-centred pedagogical strategy. When well-designed and thoughtfully implemented, it can address systemic challenges, enhance inclusion, and enrich learning experiences across mainstream and special education settings.

From interaction with the VI team members in the research team, it was found that peer assisted learning was mostly the norm in many special schools. Low vision children in the classes are asked to help the blind in their daily living as well as educational activities. Seniors in the hostels may also be asked to be peers or mentors for new coming students to help them adjust with the hostel or school environment. As VE tries to use the play-based approach for all activities, games that can be played by two or more students that assist in learning are most beneficial. Possible opportunities to integrate peer based learning are mentioned in the lessons below. In every PAL session, the activity should include:

- **Defined roles** (explorer, guide, checker, narrator)
- **Turn-taking**
- **Talk + touch together**
- **Peer feedback**, not teacher correction first

The teacher needs to be aware of how this can be introduced to the students so that they perform their role without conflicts.

Pre-Braille Foundational Skills

Conventional instructional methods emphasize on memorising braille codes and braille writing rather than more practice of tactile reading. As a result, students find reading braille material physically less engaging, and in some cases, these students suffer from academic deficiencies because of their inability to read at an age-appropriate level. As a corollary, instructional strategies emphasising interventions to enhance tactile sensitivity are necessary for resolving this issue. (Lee & Hock, 2023). Recognising this need, many nations

focus on building tactile readiness before formal reading (Lee & Hock, 2023). When preparing for braille literacy, it is important to develop tactual discrimination skills and finger sensitivity. The development of tactual discrimination begins with using the whole hand to explore objects and progresses to using fingers and fingertips to examine the details of tactile materials (Lee & Hock, 2023).

Pre-Braille refers to the foundational tactile, motor, cognitive, and concept-development skills that must be in place before formal Braille reading and writing begins. It is increasingly described as early tactile strategies and exploration, not merely “preparation for dots”. The skills that are needed are:

Textures and Tactile Discrimination

1. Exploring Textures: We can Provide opportunities to explore different textures like rough, smooth, soft, hard, etc. We Use everyday objects or textured boards.
2. Matching: Match objects with similar textures or shapes. We can use pairs of socks, textured blocks, or containers with different materials inside.
3. Sorting: Sort objects based on their tactile characteristics. For example, sort buttons by size and/or texture.
4. Identifying Shapes: we Introduce basic shapes like circles, squares, and triangles through tactile exploration. Use we shape sorters or create shapes with playdough.
5. Tracking: Following a line with their finger helps prepare for reading braille lines. Use raised lines .

Fine Motor Skills

1. Hand and Finger Strength: Activities like squeezing toys, playdough, or clay help develop hand and finger strength.
2. Pinching and Grasping: Picking up small objects like beads or buttons with tweezers or tongs improves fine motor control.
3. Bilateral Coordination: Activities that require using both hands together, such as stringing beads or tearing paper, enhance coordination. (Important as Braille reading requires the use of both hands)
4. Finger Isolation: Encourage activities that ake individual finger movements, .
5. Page Turning: Practice turning pages of a book to develop the skill needed for reading braille books.

Cognitive Development

1. Spatial Awareness: Help the child understand concepts like up, down, in, out, front, back, etc. Use games or activities that involve moving objects in space.

2. Size and Quantity Concepts: Teach concepts like big, small, more, less, and same/different using objects of varying sizes and quantities.
3. Object Manipulation: Encourage exploration and manipulation of objects to understand their properties and functions.
4. Memory and Sequencing: Activities that involve remembering patterns or sequences enhance cognitive skills.
5. Problem Solving: Encourage problem-solving skills through activities like puzzles or building challenges.

Sample Activity: Texture Discrimination

Objective

- To help children distinguish between different textures.

Materials

1. Texture cards or boards: With various textures like rough, smooth, soft, and hard.
2. Everyday objects: With different textures, such as:
 1. Rough: tree bark, sandpaper, or a rock.
 2. Smooth: a mirror, a piece of glass, or a smooth stone.
 3. Soft: a stuffed animal, a pillow, or a soft blanket.
 4. Hard: a book, a toy block, or a metal spoon.

Instructions

1. We can Prepare the texture cards or boards and gather the everyday objects.
2. Blindfold the child or ask them to close their eyes if they are partially cited.
3. Present the child with two objects, one with a rough texture and the other with a smooth texture.
4. Ask the child to identify which object is rough and which is smooth.
5. Repeat the process with the other textures (soft and hard).
6. Gradually increase the difficulty level by giving multiple objects with different textures.

A summary of the pre-Braille skills and their importance as found from the interviews and secondary research are given below:

Pre-Braille Foundational Skills: Tabulated Overview

Domain	Why This Domain Is Important	Key Skills	Typical / Recommended Activities
A. Tactile & Sensory Readiness	Foundation for tactile literacy and Braille readiness; emphasized in literature and	<ul style="list-style-type: none"> • Texture discrimination • Light touch (not pressing) • Palm → finger → 	<ul style="list-style-type: none"> • Sorting textured objects • Matching rough/smooth/hard/soft • Clay manipulation,

	Perkins-aligned resources	fingertip progression • Shape, size, weight recognition	crumpling paper • Nature baskets, sensory story boxes
B. Fine Motor & Two-Handed Coordination	Braille reading requires bilateral hand use and finger independence	• Grasp & release • Finger isolation • Two-handed exploration • Wrist and finger strength	• Bead stringing • Button boards • Marble board activities • Pegboards and tactile puzzles
C. Spatial, Positional & Directional Concepts	Essential prerequisite for understanding Braille dot placement and reading sequence	• Left/right • Top/bottom • Above/below • Horizontal/vertical • Left → right, top → bottom reading order - Opposite positions	• Object placement in reading order • 5-Minute Concept Book • Body-based direction activities • Real-world positioning
D. Concept & Language Development	Ensures meaning-making before symbolic Braille learning; addresses teacher preparedness gaps	• Understanding Braille as a code for language • Concept clarity • Vocabulary development	• Story boxes with real objects • Tactile storytelling • Joint attention through touch • Explicit vocabulary instruction

In the Appendix gives a sample lesson plan to conduct these exercises with the students in a systematic manner. The mapping of how these activities realize Braille readiness goals is also summarized. A Pre-Braille Learning Kit with items needed to conduct these activities are also tabulated for deployment of the pre-Braille learning activities in the schools. These can also be introduced to the parents or caregivers.

TODO : Coordinate these activities with the ECCE program activities and mention the activities that should be done from that manual instead of separately giving activities in this manual.

Peer Assisted Learning Integration

If the activities are to be done with peers, slight modifications for the activity may be needed. For example, for the activity, Sorting Textured Objects, a pair or group of 3 children can be asked to work together.

- One child explores and sorts
- One peer checks and confirms
- One peer describes aloud (“This feels rough”)

Hearing a peer describe texture reinforces tactile discrimination and vocabulary.

Children can also work with each other and complete an activity only if there is consensus. For example: for the activity of matching Rough / Smooth / Hard / Soft, a Buddy pair can be setup.

- Child A selects an object
- Child B finds its matching texture
- Both agree before placing it

Peers can discuss, debate and justify their choice verbally, strengthening concept clarity.

With peer assisted, clay Manipulation activity, they can learn shape concepts and descriptive language together. They can take turns to tell a story about the objects they are working with and co-construct the meaning they associate. More such options are discussed in the Appendix.

From Pre-Braille to Early Braille Literacy

When is a child ready for formal Braille?

The following can be a set of readiness indicators that can indicate whether the student is ready to move to formal Braille Learning. (Appendix – Tool for assessment of Braille Readiness)

- Sustained tactile attention
- Accurate texture discrimination
- Understanding of spatial terms
- Efficient hand positioning
- Interest in symbolic meaning

Once the child has been identified as ready for Braille learning, we can start the first lessons of English Braille to the child. We can progressively conduct the following lessons as the first lessons to the child.

Step 1: Braille Cell Awareness

Objective: To understand the 3x2 grid based Braille Cell Structure

Materials Needed:

- a) Tactile Peg Cell
- b) Large sized 3 X 2 Tactiles

Instructions for the teachers:

- a) Let the students hold the cell and pegs and play with it for some time
- b) Tell the students:
 - The braille cell is made up of six dots arranged in a 2x3 grid. Each dot is numbered 1 through 6:
 - Dots 1, 2, and 3 are on the left from top to bottom.
 - Dots 4, 5, and 6 are on the right from top to bottom.
- c) “Dot Detective” or “Touch and tell where they are” game
 - a. Ask them to put the pegs in any position and swap with their friend who is asked to say the position of the pegs. If it is said correctly, applaud them
- d) “Dot Builder” or “Put it where it is told” game
 - a. Give the number position number and ask to put the pegs in that position
 - b. Alternately, can be done with Simon Says game as well
- e) Repeat with different rounds to gain confidence
- f) Quiz:
 - a. The cell below 1 is 2
 - b. The cell below 2 is 3
 - c. The cell below 3 is Nothing
 - d. The cell below 4 is 5
 - e. The cell below 5 is 6

Similarly, ask questions, about cell above, cell to the right, cell to the left cell diagonal to

Following Kinesthetic activities can be integrated to make the understanding about the Braille cell and its positions clear to the students.

Task 1 : Large-Scale Body Movement Activities : Human Braille Dots

- * Create a large 3x2 grid on the floor using ropes or tape.
- * Have students stand in different positions to form Braille letters.
- * Example: To form the letter "A" (dot 1), one student stands in the first position.

Task 2: Braille Hopscotch

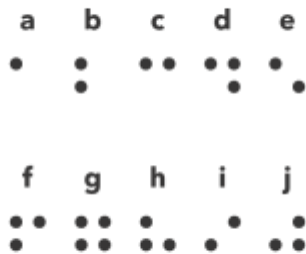
- * Draw large Braille cell grids on the ground.

- * Call out a Braille letter, and students jump onto the correct dots.
- * Helps develop muscle memory for dot positions.

Task 3: Braille Dance Game

- * Assign different dance movements to each Braille dot number.
- * Call out a Braille letter, and students perform movements matching the dot positions.

Step 2: Alphabet Introduction – 1 (A–J)



a	1
b	1, 2
c	1, 4
d	1, 4, 5
e	1, 5
f	1, 2, 4
g	1, 2, 4, 5
h	1, 2, 5
i	2, 4
j	2, 4, 5

Teacher has to make them memorize the dots used to represent the letters from A to J. After they memorize the dots, through activities she has to make them perfect. Ask them to place the 4 circle objects in the place of 1, 2, 4, 5. After placing, ask them to take out the objects from the place of 2, 4 and 5 then tell them this is A. then ask them to place 1 circle object below that and tell them this is 1-2 = B. then tell them to take out the object which is below and place it opposite to 1 this is C (1-4). Then ask the students to take another object and keep it below the right side object, this becomes D (1-4-5). Then ask them to take out the right side top object, this is E (1-5). Then ask the students to take out the object which is in the right side and keep it below the left side and take another object and place it in the top right, this becomes F (1-2-4). Then ask students to take another object and place it below the right side one, this becomes G (1-2-4-5). Then ask them to take out right side top object, this becomes H (1-2-5). Then ask them to take out the right side one and take out left side top object and keep it in the right side top, this becomes I (2-4). Then take one object and keep opposite to left side object, this becomes J (2-4-5).

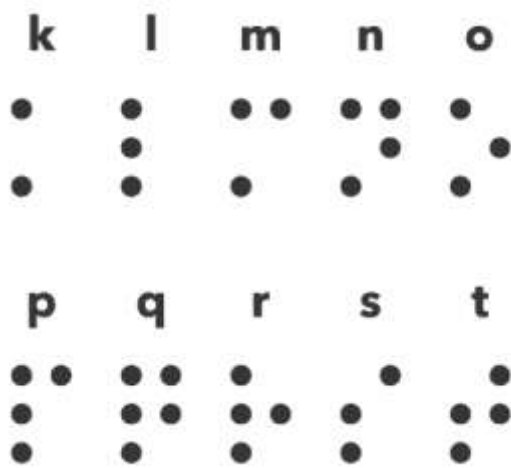
Repeated enforcement of codes for each letters has to be done till the child remembers the patterns without hesitation.

Exercises:

- Identification of letter – this can be asked by the teacher or he/she can make a group of peers and ask each other orally in the beginning, later on by placing the objects.
- What letters have 2 dots (B, C, E, I).
- What letters have 3 dots (D, F, H, J).
- What letters has only 1 dot (A).
- What letters have 4 dots (G).
- Ask the students which letters have similarities (D & F, H & J, E & I)

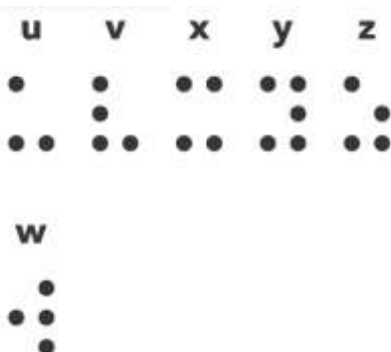
To make them practice, they can use marble board which has 6 holes (3 in left and 3 in right) and marbles to represent the dots by placing them in the holes. We can also use peg board, which is smaller than marble board and pegs can be fixed in the holes. We can also use brilet board which has smaller holes than peg board. We can use cube which has three partition (upper, middle & lower), each partition has 2 dots opposite to each other. Students should turn the cubes to form the letters.

Step 3: Alphabet Introduction – 2 (K-T)



Letter	Dot configuration
k	1, 3
l	1, 2, 3
m	1, 3, 4
n	1, 3, 4, 5
o	1, 3, 5
p	1, 2, 3, 4
q	1, 2, 3, 4, 5
r	1, 2, 3, 5
s	2, 3, 4
t	2, 3, 4, 5

Step 4: Alphabet Introduction – 3 (U-Z)



Letter	Dot configuration
u	1, 3, 6
v	1, 2, 3, 6
x	1, 3, 4, 6
y	1, 3, 4, 5, 6
z	1, 3, 5, 6
w	2, 4, 5, 6

Game: Play Braille Alphabet Bingo

Materials Needed:

- Printable Bingo Cards (5x5 grid with Braille letters)
- Braille Letter Call-Out Cards
- Small tokens, buttons, or stickers as bingo markers
- Optional: Braille key or alphabet chart for reference

Game Rules:

1. Give each student one Braille bingo card.
2. Read aloud (e.g., “B”) from a shuffled stack of call-out cards.
3. Students look for the Braille version of that letter on their bingo card.
4. If they have it, they mark it.
5. First to complete a row, column, or diagonal shouts "Bingo!" and wins.

⠠ (D)	⠠ (F)	⠠ (H)	⠠ (G)	⠠ (E)
⠠ (S)	⠠ (W)	⠠ (N)	⠠ (T)	⠠ (I)
⠠ (L)	⠠ (K)	FREE	⠠ (O)	⠠ (V)
⠠ (M)	⠠ (J)	⠠ (P)	⠠ (B)	⠠ (Y)
⠠ (C)	⠠ (U)	⠠ (R)	⠠ (Z)	⠠ (X)

Step 5: Capital Letters (Dot 6 only cell) before the letter

Materials : 2 Braille cells are needed for this

Instructions:

- Ask the student to create the first letter of their name in a cell
- Ask them to place the peg in position 6 in another peg and place it before this cell
- Ask them to read the cells together
- Cell 1 – Position 6 and then the letter A is capital letter A
- Repeat with first letter of their family members/ friends’ names

A set of useful quizzes to reinforce letter knowledge is given in the Appendix.

Step 6: Numbers

Teaching Method:

- Teach Numbers 1-9 and 0 (same as letters A-J but with a number sign ⠠ (dots of number sign 3-4-5-6)).

- Example:

- ⠠1 → A (1), ⠠1-2 → B (2), ..., ⠠0 → J (0) (2-4-5)

- Use tactile counting blocks to reinforce numbers.

- Teach basic math symbols (+, -, X, =) in Braille.

- ◆ Task 1: Match Numbers

- Provide Braille numbers (⠠1, ⠠2, ⠠3) and ask students to match them to spoken numbers.

- ◆ Task 2: Fill in Missing Numbers

- Example: ⠠1, ⠠2, __, ⠠4, __ – Students fill in gaps.

Step 7: Punctuation

Step 8: Reading 2-letter words

Audio support: Spell each word aloud while the student reads by touch.

am
an
at
be
do
go
he
hi
if
in
is
it
me
my
no
of
on
to
up
we

Step 9: Reading 3-letter words

1. the

2. and
3. for
4. you
5. all
6. any
7. can
8. had
9. her
10. him
11. his
12. how
13. man
14. new
15. not
16. now
17. old
18. one
19. our
20. two
21. sun

Once the child can read 1, 2 and 3 letter words, they can be taught articles:

A dog (use of article A)

An ear (use of article an)

The Sun (use of article The)

Subsequently, short phrases can be introduced as well:

A man
An old man
The Sun

Idea of personal pronouns

I
You
He/ She/ It
We
Us
Him/ Her/ Them
Me

Idea of nouns as names of people or other living/ non-living things can be introduced with these words

Dog
Man
Sun
Fan
Den
Sky

Prepositions as words that show relationship between two nouns can be introduced. are 2/3 letters. They can be introduced with tactile inputs to show the relationships between the objects.

On , Of, At, In
Tactile input : A leaf in a cup of water kept on the table at lunchtime

Step 10: Reading 4-letter words

this
that
with
have
from
they
will
your
what
when
were
them
been
some
more
want
time
know
look
make

Task 1: Spin a story : Choose two or three words from this list and spin a story with them. The words can be introduced in the following progression:

Task 2: Continue learning about pronouns, nouns, prepositions

Step 11: Revision

- ◆ Task 1: Audio Challenge

- Read a sequence of letters aloud and tell the students write in Braille.

- ◆ Task 2: Identify Random Letters

- Provide random Braille letters. Ask students to read and say them aloud.

- ◆ Task 3: Find the Letter by Sound

- Read a letter, and the student identifies the correct Braille letter.

Task 4 : Match Words

- Provide Braille word strips.

- Students match them to spoken words or raised print letters.

- ◆ Task 5: Fill in the Missing Letter

- Provide Braille words with missing letters (c_t, d_g, h_t).

- Students fill in missing Braille letters.

- ◆ Task 6: Identify the Word

- Read aloud a word and have students find it in Braille.

- ◆ Task 7: Arrange Letters in Order

- Give students scattered Braille letters (A to Z) and ask them to rearrange.

- ◆ Task 8: Write names

- Create your Braille Name Labels. Create for your family and friends

Use of AT for Braille Literacy

Research points to the fact that

- **Multisensory learning (tactile + auditory + kinesthetic)** is essential
- **Technology supports**, but does **not replace** tactile literacy
- Over-reliance on audio reduces Braille retention

Due to the high cost and time needed to print Braille on paper (special paper, embosser, storage challenges etc), the team resorted to using the Hexis devices already available in the schools for promoting reading of curricular and extra-curricular materials in Braille by higher

grade students. Hexis Refreshable Braille Reader is an accessible and sustainable way to Publishing Braille Reading Lessons as common content in Hexis.

For using Hexis Reader as a learner for beginners as well, some settings have to be appropriately setup:

- a) Contraction – Off
- b) Word wrap – Off

The lessons for letters, 2 and 3 letter words are to be published as common Content in the Antara Content Management system in a special folder.

Task 1: Find the word (Quiz Mode on Hexis)

1. The Braille word IN is read aloud.

Listen carefully and find the same braille word among the options on the HEXIS: IS, IT, IN, and ON.

IS SPACE IT SPACE IN SPACE ON

2. The Braille word UP is read aloud.

Listen carefully and find the same braille word among the options on the screen: IS, UP, IT, and ON.

IS SPACE UP SPACE IT SPACE ON

3. The Braille word BY is read aloud.

Listen carefully and find the same braille word among the options on the screen: TO, MY, DO, IN, and BY.

TO SPACE MY SPACE DO SPACE IN SPACE BY

4. The Braille word AT is read aloud.

Listen carefully and find the same braille word among the options on the screen: AS, TO, ON, and AT.

AS SPACE TO SPACE ON SPACE AT

5. The Braille word DOG is read aloud.

Listen carefully and find the same braille word among the options on the screen: DIG, MAN, BIG, and DOG.

DIG SPACE MAN SPACE BIG SPACE DOG

6. The Braille word RUN is read aloud.

Listen carefully and find the same braille word among the options on the screen: AN, SUN, MAN, and RUN.

AN SPACE SUN SPACE MAN SPACE RUN

7. The Braille word PEN is read aloud.

Listen carefully and find the same braille word among the options on the screen: DO, DOG, SIT, and PEN.

DO SPACE DOG SPACE SIT SPACE PEN

Task 2: Who is there? Find the animal from its sound (Audio content)

Letter	Sound	Question	Expected Response
B	Buzzing bee	"What is that?"	"It is a bee."
C	Cat meowing	"What do you hear?"	"I hear a cat."
D	Dog barking	"Who is barking?"	"It is a dog."
E	Elephant trumpeting	"What sound is this?"	"That is an elephant."
F	Frog croaking	"Who is croaking?"	"That is a frog."
G	Goat bleating	"What sound is that?"	"That is a goat."
H	Hen clucking	"Who is clucking?"	"It is a hen."
I	Ice cream truck music	"What do you hear?"	"That is an ice cream truck."
J	Jingle bell ringing	"What is ringing?"	"I hear a jingle bell."
L	Lion roaring	"Who is roaring?"	"It is a lion."
M	Monkey screeching	"What do you hear?"	"I hear a monkey."
P	Parrot talking or squawking	"Who is talking?"	"It is a parrot."
S	Snake hissing	"What sound is this?"	"That is a snake."
X	Xylophone ringing notes	"What is making that sound?"	"That is a xylophone."

Task 3 : Find the missing letter

General Instructions:

(Four Braille letters are displayed)

E SPACE B SPACE A SPACE F

1. (Identify the Braille letters one by one)
2. (Read aloud the Braille letters one by one)

P SPACE W SPACE L SPACE S

(Four Braille letters are displayed)

1. (Identify the Braille letters one by one)
2. (Read aloud the Braille letters one by one)

E SPACE F SPACE G SPACE H

(Four Braille letters are displayed)

1. (Identify the Braille letters one by one)
2. (Read aloud the Braille letters one by one)

G SPACE K SPACE U SPACE S

(Four Braille letters are displayed)

1. (Identify the Braille letters one by one)
2. (Read aloud the Braille letters one by one)

G SPACE O SPACE W SPACE Q SPACE V

(Five Braille letters are displayed)

(Braille letter V is read aloud. Listen carefully and find the same braille letter among the options)

P SPACE K SPACE X SPACE H SPACE B SPACE E

(Six Braille letters are displayed)

(Braille letter H is read aloud. Listen carefully and find the same braille letter among the options)

E SPACE R SPACE G SPACE A SPACE I SPACE O

(Six Braille letters are displayed)

(Braille letter R is read aloud. Listen carefully and find the same braille letter among the options)

R SPACE V SPACE I SPACE Q SPACE P

(Five Braille letters are displayed)

(Braille letter I is read aloud. Listen carefully and find the same braille letter among the options)

Task 4: Fault Finder For Good – Peer Assisted Learning

Feed the following lines in Hexis and let students take turns to read. Once they have read it out aloud, they can think and see if there are any mistakes to be corrected. Once done, they should pass the device to the peer who can read and confirm the decision: Mistakes could be in the grammar or in the meaning.

a) The dob is wearing a hat

b) The cat is in the mat

- c) **The bone ate the dog**
- d) **The ball is in the bag**
- e) **The dog hit the car**
- f) **The bag fell on the cat**
- g) **The dog sat at sun**
- h) **The cat hid the dog from**
- i) **Big ball is this a**

Task 5: Make meaningful sentences from words

Two Braille words are displayed on the reader. Teacher to check - can you identify the Braille words? The teacher waits for the students to answer and identify the braille words by reading them aloud.

Teacher: Can you work (alone or with your partner) to make a sentence using both 2 words? The teacher waits for the students to make a sentence using the words cat and mat. The teacher confirms the sentence is correct or asks them to try again.

Words to be uploaded to Hexis:

Cat mat

Hat dog

Ball dog

Rat cat

Etc.

Details of the other Braille related AT devices are shared in the Appendix. They are not explored for creating the lessons plans due to lack of availability.

Order of introducing Braille Learning Tools

What Is the order in which these tools should be introduced?

- a) Marble/ Peg Board
- b) Pin Board
- c) Braille slate / Stylus
- d) Printed Text
- e) Hexis Braille Reader

Conclusion

With this research we have tried to delve deep into the origins and current practices of Braille teaching and learning. We have tried to prepare lesson plans that can be given to teachers and VE team to help the children pickup Braille without any difficulties. By focussing on Braille readiness with Pre-Braille activities, this report intends to create a gradual, meaningful progression to literacy. It also has proposed various ways in which ATs

can be used to address any resource constraints and systematically introduce Braille to a large number of students. The pilot implementations of this curriculum will shed more light on the usability and efficacy of the planned lessons. Taking feedback from the ground, changes will be done till the document reaches a state of maturity.

Next steps

- How to support Braille Writing along with reading
- What are the practices for teaching regional Braille Scripts and languages
- Will large print flash cards be helpful for low vision children to learn Braille faster?
- What are the modifications needed for late blind students?
- Program for sighted adults who need to learn Braille to support their students

An extended program may be launched based on the lessons learnt in this pilot to enhance inclusive education by designing a curriculum to be introduced to teachers in B Ed programs and children in elementary sections in special schools and inclusive schools.

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Appendix

Lesson Plan for Pre-Braille Training

LESSON SET 1: TACTILE & SENSORY READINESS

Theme: “Touch Detectives”

Objective

Children develop **texture discrimination, light touch, and fingertip exploration.**

Materials

- Fabric pieces (silk, cotton, jute)

- Sponges, stones, leaves
- Bowls or cloth bags
- Clay or dough

Duration

30 minutes

Activities

1. Mystery Texture Bags (10 mins)

- Children put one hand into a bag and describe what they feel
- Prompt with words: *rough, smooth, soft, hard*
- No guessing aloud first—feel, explore, then name

2. Texture Sorting Game (10 mins)

- Sort objects into labeled baskets (rough / smooth)
- Encourage **light fingertip touch**, not pressing

3. Clay Magic (10 mins)

- Roll, pinch, flatten clay
- Make shapes: ball, snake, pancake
- Focus on palm → finger → fingertip movement

Skill Focus

- ✓ Texture discrimination
- ✓ Light touch
- ✓ Hand awareness

LESSON SET 2: FINE MOTOR & TWO-HANDED COORDINATION

Theme: “*Busy Fingers Workshop*”

Objective

Build **finger strength, bilateral coordination, and finger isolation.**

Materials

- Beads and string

- Button boards
- Pegboards
- Marble board (6-hole pattern if available)

Duration

35 minutes

Activities

1. Bead Stringing Relay (10 mins)

- Use both hands: one hand holds string, the other strings beads
- Encourage slow, controlled movements

2. Button & Snap Boards (10 mins)

- Button using index finger and thumb
- Switch hands midway

3. Marble Board Play (15 mins)

- Place marbles in holes freely
- Teacher gives fun challenges:
 - “Put 2 marbles anywhere”
 - “Put one on the left, one on the right”
(No letters introduced yet)

Skill Focus

- ✓ Grasp & release
- ✓ Two-handed use
- ✓ Finger independence

LESSON SET 3: SPATIAL, POSITIONAL & DIRECTIONAL CONCEPTS

Theme: “My Body, My Space”

Objective

Understand **left/right, top/bottom, and reading direction.**

Materials

- Child's own body
- Tabletop objects
- Tactile mats or trays

Duration

30 minutes

Activities

1. Body Directions Game (10 mins)

- "Touch your left knee"
- "Raise your right hand"
- Pair children to mirror actions

2. Tabletop Treasure Hunt (10 mins)

- Place objects top-left, bottom-right, center
- Give instructions:
"Find the object at the top"

3. Reading Path Game (10 mins)

- Move hands left → right across objects
- Then top → bottom rows
- Reinforce *how hands will move while reading Braille*

Skill Focus

- ✓ Directionality
- ✓ Spatial awareness
- ✓ Reading sequence

LESSON SET 4: CONCEPT & LANGUAGE DEVELOPMENT

Theme: "Stories You Can Touch"

Objective

Build **meaning, vocabulary, and concept clarity** before symbols.

Materials

- Story box (real objects: cup, leaf, spoon, toy)
- Simple tactile book or homemade pages

Duration

35 minutes

Activities

1. Story Box Exploration (15 mins)

- Each child explores objects
- Teacher narrates a story using objects
- Encourage children to describe what they feel

2. Tactile Story Sequencing (10 mins)

- Arrange objects in story order
- Discuss beginning / middle / end

3. Word Builder Talk (10 mins)

- Explicit vocabulary teaching
- Example: *round, long, heavy, empty*

Skill Focus

- ✓ Language development
 - ✓ Concept clarity
 - ✓ Meaning before symbols
-

WEEKLY STRUCTURE (SUGGESTED)

Day Focus

Day 1 Tactile & Sensory Readiness

Day 2 Fine Motor & Two-Handed Skills

Day 3 Spatial & Concept Development

ASSESSMENT (INFORMAL & FUN)

- Can the child explore without pressing?

- Are both hands used together?
- Can the child follow left/right instructions?
- Does the child describe objects meaningfully?

Use **observation notes**, not tests.

KEY TEACHING PRINCIPLES

- ✓ Play before print
- ✓ Experience before dots
- ✓ Meaning before memorization
- ✓ Hands before symbols

Lesson Plan for Pre-Braille Training with Peer Assisted Learning Approach

1. Sorting Textured Objects

Peer setup: Pair or group of 3

- One child explores and sorts
- One peer **checks and confirms**
- One peer **describes aloud** (“This feels rough”)

Why PAL works:

Hearing a peer describe texture reinforces tactile discrimination and vocabulary.

2. Matching Rough / Smooth / Hard / Soft

Peer setup: Buddy pairs

- Child A selects an object
- Child B finds its matching texture
- Both agree before placing it

Added peer element:

Peers **justify their choice verbally**, strengthening concept clarity.

3. Clay Manipulation & Paper Crumpling

Peer setup: Small groups (3–4)

- Each child makes a different shape
- Peers guess the shape by touch
- Group compares shapes

Why PAL works:

Peers learn **shape concepts** and **descriptive language** together.

4. Nature Baskets & Sensory Story Boxes

Peer setup: Circle group

- One child explores an object
- Another narrates a story line
- Another adds a sound or description

Peer value:

Children co-construct meaning instead of passively receiving it.

B. FINE MOTOR & TWO-HANDED COORDINATION (PEER-BASED)

5. Bead Stringing

Peer setup: Pairs

- One child strings beads
- The other **counts aloud or guides hand placement**
- Switch roles

Why PAL works:

Encourages bilateral coordination and cooperative pacing.

6. Button Boards

Peer setup: Buddy system

- Child A attempts buttoning
- Child B offers **verbal prompts only** (“Try the top button”)
- No hand-over-hand unless needed

Peer value:

Builds confidence and independence with social support.

7. Marble Board Activities

Peer setup: Pairs or triads

- One child places marbles
- One describes position (“left top”, “right bottom”)
- One checks accuracy

Critical PAL benefit:

Peers reinforce **Braille cell spatial language** naturally.

8. Pegboards & Tactile Puzzles

Peer setup: Cooperative task

- One child holds the board
- One inserts pegs
- One identifies shape/location

Why PAL works:

Shared attention improves spatial reasoning and teamwork.

C. SPATIAL, POSITIONAL & DIRECTIONAL CONCEPTS (PEER-BASED)**9. Object Placement in Reading Order**

Peer setup: Pairs

- Child A arranges objects
- Child B checks reading order (left → right)
- Both trace together

Peer value:

Builds early Braille tracking habits.

10. 5-Minute Concept Book

Peer setup: Small groups

- Each child contributes one page/object
- Group reads pages together
- Peers ask questions

Why PAL works:

Encourages narrative sequencing and shared literacy.

11. Body-Based Direction Activities

Peer setup: Partner play

- One child gives direction commands
- The other follows
- Switch roles

Peer value:

Language and movement reinforce spatial concepts together.

12. Real-World Positioning

Peer setup: Pair navigation

- One child gives directions
- Other follows to locate object/space
- Reflect together

Why PAL works:

Builds trust, orientation skills, and functional independence.

D. CONCEPT & LANGUAGE DEVELOPMENT (PEER-BASED)

13. Story Boxes with Real Objects

Peer setup: Group storytelling

- Each child adds an object
- Peers build the story collaboratively

Peer value:

Language grows through shared imagination and tactile cues.

14. Tactile Storytelling

Peer setup: Buddy reading

- One child explores objects
- The other narrates
- Both retell together

Why PAL works:

Combines listening, touch, and expression.

15. Joint Attention Through Touch

Peer setup: Pairs

- Both explore the **same object at the same time**
- One describes while the other feels

Critical benefit:

Develops shared focus—essential for literacy learning.

16. Explicit Vocabulary Instruction

Peer setup: Word partners

- One child introduces a word
- Other finds an object/action to match
- Peers quiz each other

Peer value:

Vocabulary becomes **social and meaningful**, not memorised.

Mapping of Pre-Braille Learning activities and their contribution to Braille readiness

A. Tactile & Sensory Readiness → Braille Readiness

Activity	What the Child Does	Pre-Braille Skill Developed	Direct Braille Readiness Outcome
Mystery Texture Bags	Explores objects using hands and fingertips	Texture discrimination, light touch	Ability to distinguish raised Braille dots without pressing
Texture Sorting Game	Sorts objects by tactile qualities	Fine tactile discrimination	Differentiates dot patterns within the Braille cell
Clay Manipulation	Rolls, pinches, flattens clay	Palm → finger → fingertip progression	Controlled fingertip contact needed for fluent Braille reading
Nature Baskets / Sensory Story Boxes	Explores real-world textures	Sensory awareness and curiosity	Builds tactile confidence and sustained touch exploration

B. Fine Motor & Two-Handed Coordination → Braille Readiness

Activity	What the Child Does	Pre-Braille Skill Developed	Direct Braille Readiness Outcome
Bead Stringing	Uses one hand to hold, the other to string	Bilateral coordination	Two-handed Braille reading (tracking and previewing)
Button Boards	Uses thumb–index finger control	Finger isolation and strength	Accurate dot discrimination using individual fingers
Pegboards / Tactile Puzzles	Places pegs using controlled finger movements	Wrist and finger stability	Smooth hand movement across Braille lines
Marble Board Activities	Places marbles in different hole combinations	Hand coordination + pattern awareness	Implicit understanding of 6-dot Braille cell structure (63 combinations)

Field Insight:

Nagarathna’s marble-board play demonstrates that children can *experience all Braille dot combinations through play* before learning letters—supporting concept-before-code learning.

C. Spatial, Positional & Directional Concepts → Braille Readiness

Activity	What the Child Does	Pre-Braille Skill Developed	Direct Braille Readiness Outcome
Body Directions Game	Identifies left/right on own body	Body-based spatial awareness	Understanding dot positions (left/right columns in Braille cell)
Tabletop Treasure Hunt	Locates objects using position cues	Top/bottom, above/below concepts	Correct interpretation of dot numbers (1–6)
Object Placement in Rows	Explores objects arranged in rows	Linear sequencing	Left-to-right, top-to-bottom Braille reading
Reading Path Game	Moves hands systematically across objects	Directional tracking	Efficient hand movement during Braille reading

D. Concept & Language Development → Braille Readiness

Activity	What the Child Does	Pre-Braille Skill Developed	Direct Braille Readiness Outcome
Story Box Exploration	Connects objects with spoken language	Concept development	Assigns meaning to Braille symbols
Tactile Storytelling	Listens and touches simultaneously	Language–touch integration	Comprehension while reading Braille text
Story Sequencing	Orders objects meaningfully	Narrative sequencing	Understanding sentences and paragraphs
Explicit Vocabulary Talk	Learns descriptive words through touch	Vocabulary expansion	Improved Braille reading comprehension

SUMMARY MAP: FROM PLAY TO BRAILLE

Pre-Braille Domain	What It Enables in Braille
Tactile Sensitivity	Feeling dots accurately
Fine Motor Control	Smooth, fluent reading
Two-Handed Use	Faster, efficient Braille reading
Spatial Concepts	Understanding dot positions
Directionality	Correct reading order
Concept & Language	Meaningful literacy, not memorization

Pre-Braille Learning Kit

A kit with materials needed for Pre-Braille activities is given below:

A. TACTILE & SENSORY READINESS MATERIALS

Material	Description / Use	Quantity (per kit)
Fabric swatches	Cotton, silk, jute, wool, denim	2 pieces × 5 textures = 10 pieces
Texture objects	Sponge, stone, rubber ball, wooden block, foam	1 set each (5–6 objects)
Texture sorting trays	Shallow trays or baskets	4 trays
Mystery bags	Cloth drawstring bags (non-transparent)	6 bags
Modeling clay / dough	For rolling, pinching, shaping	6 small tubs
Paper for crumpling	Thick paper / newspaper	30 sheets
Nature objects	Leaves, seeds, shells, twigs (sealed)	1 boxed set (15–20 items)
Sensory story box	Storage box with mixed tactile items	1 box

B. FINE MOTOR & TWO-HANDED COORDINATION MATERIALS

Material	Description / Use	Quantity (per kit)
Beads	Large-hole beads (safe size)	60 beads
Laces / strings	Thick shoelace-type strings	8 strings
Button boards	Buttoning and snapping practice	4 boards
Pegboards	Large pegs with board	4 pegboards
Pegs	Spare pegs	40 pegs
Marble boards	6-hole boards for Braille-cell play	4 boards
Marbles	Large, tactile-safe marbles	30 marbles
Tactile puzzles	Simple shape puzzles	4 puzzles

C. SPATIAL, POSITIONAL & DIRECTIONAL MATERIALS

Material	Description / Use	Quantity (per kit)
Tactile mats	Rubber / felt mats with boundaries	6 mats
Position markers	Raised dots, foam shapes	30 pieces
Direction cards (tactile)	Left/right/top/bottom markers	1 set (8–10 cards)
Tabletop trays	For arranging objects in rows	4 trays
Body-direction bands	Wristbands (left/right identification)	8 bands

D. CONCEPT & LANGUAGE DEVELOPMENT MATERIALS

Material	Description / Use	Quantity (per kit)
Story objects	Cup, spoon, toy animal, leaf, ball	10–12 objects
Tactile story books	Homemade or commercial	4 books
Sequencing boards	Three-part tactile boards	4 boards
Vocabulary objects	Objects showing size/shape/weight	10 items
Audio recorder (optional)	For recording stories	1 device

E. GENERAL & SUPPORT MATERIALS

Material	Purpose	Quantity
Storage bins	Domain-wise organization	5 bins
Zip pouches	Individual child kits	8 pouches
Non-slip mats	Table safety	4 mats
Hand wipes	Hygiene after tactile play	1 pack
Observation sheets	Teacher assessment	20 sheets
Teacher guide booklet	Activity instructions	1 booklet

Tool for assessment of the readiness from Pre-Braille to Braille Literacy

Braille readiness should not be measured through formal testing. Instead, it is assessed through structured observation during play and guided activities, using consistent indicators, time thresholds, and task performance.

1. Sustained Tactile Attention – To measure if the child can remain engaged in tactile exploration without withdrawing, rushing, or becoming distracted.

Assessment Method	What to Observe	Indicator of Readiness
Timed tactile task	Child explores objects/textures	Maintains tactile engagement for 3–5 minutes
Multi-step tactile activity	Sorting or sequencing	Completes task without abandoning
Free tactile play	Chooses to continue exploring	Returns to tactile task independently

2. **Accurate Texture Discrimination** - The child can identify differences in texture using touch alone.

Assessment Method	Task	Indicator of Readiness
Texture matching	Match identical textures	Matches 4 out of 5 correctly
Sorting task	Group rough vs smooth	Sorts with minimal correction

Assessment Method Task**Indicator of Readiness**

Blind comparison Same/different judgment Correctly identifies differences

3. Understanding of Spatial Terms - The child understands positional and directional language, which is critical for Braille dot placement.

Assessment Method Task**Indicator of Readiness**

Body-based commands "Touch your left hand" Responds correctly **without cues**

Tabletop positioning Place object "on top / below" Correct placement

Sequencing task Arrange objects left → right Follows correct order

4. Efficient Hand Positioning - The child uses light touch, relaxed hands, and begins to coordinate both hands.

Assessment Method What to Observe**Indicator of Readiness**

Tactile tracking Hands move smoothly across objects No pressing or scrubbing

Two-hand task One hand explores, other stabilizes Both hands used purposefully

Finger use Fingertips rather than palms Fingertip-led exploration

5. Interest in Symbolic Meaning - The child shows curiosity about marks, patterns, and meaning, even before letters.

Assessment Method Task**Indicator of Readiness**

Pattern exploration Repeated dot/shape patterns Notices and comments

Symbol-object pairing Object → tactile symbol Makes associations

Choice behavior Chooses symbol-based play Voluntary engagement

Quizzes for Early Braille Literacy

From : <https://create.kahoot.it/share/a-z-braille-letter-practice/ed0209a6-4f0e-4470-900e-c18976d36cce>

What letter is made with dots 1 and 3?

What letter is made with dots 1 and 2?

what letter is made with dots 1, 2, 3, and 4?

what letter is made with dots 1, 3, and 6?

what letter is made with dots 1, 2, and 3?
what letter is made with dots 1, 3, 4, and 6?
what letter is made with dots 1, 3, 5, and 6?
what letter is made with dots 1, 4, and 5?
what letter is made with dots 2, 4, 5, and 6?
what letter is made with dots 2, 3, 4, and 5?
what letter is made with dots 1, 2, 3, and 6?
what letter is made with dots 1, 2, and 5?
what letter is made with dots 2, 4, and 5?
what letter is made with dots 1, 2, 3, and 5?
what letter is made with dots 1, 2, 3, 4, and 5?
what letter is made with dots 1, 3, 4, and 5?
what letter is made with dots 1, 3, 4, 5, and 6?
what letter is made with dots 1, 3, and 5?
what letter is made with dots 2, 3, and 4?
what letter is made with dots 1, 3, and 4?

Baseline assessment questions for Educators before Braille Learning Program

1. What is the student's current level of tactile sensitivity and hand coordination?
(e.g., Can they feel small textures, trace shapes, or identify raised patterns?)
2. How familiar is the student with raised symbols, textured objects, or pre-Braille materials?
3. Does the student show interest in exploring objects or books using their hands?
4. How long can the student maintain focus on tactile tasks?
(e.g., attention span with touch-based activities)
5. What is the student's response to structured routines and step-by-step tasks?
6. Does the student exhibit signs of frustration, confusion, or excitement during tactile learning?
7. What Braille-related skills (if any) does the student already have?
(e.g., familiarity with a slate and stylus, Braille cell, or alphabet letters)

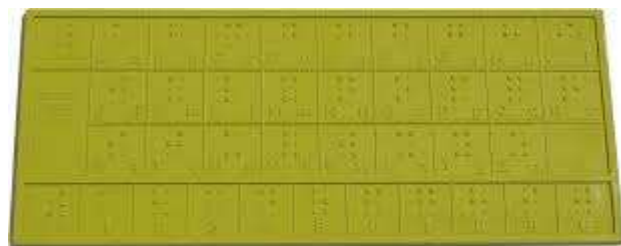
8. What environmental or behavioral factors may affect the student's learning process?
(e.g., posture, hand dominance, fatigue, lighting, distractions)

Observation Checklist for Educators after Braille Learning Program

1. Can the student accurately identify and distinguish Braille letters by touch?
2. How fluent is the student in reading simple Braille words or sentences?
3. Has the student's finger strength, speed, or tactile focus improved?
4. How confident is the student while using Braille materials independently?
5. Can the student follow Braille on different surfaces (e.g., paper, labels, books)?
6. What is the student's attitude toward Braille learning now compared to before?
(e.g., motivation, excitement, avoidance, frustration)
7. Does the student require less prompting or support to complete Braille tasks?
8. Have there been any improvements in the student's academic engagement or literacy behaviors (e.g., storytelling, letter recognition, participation)?
9. Are there noticeable improvements in spatial awareness or hand-tracking movements?
10. What teaching strategies proved most effective or needed adjustments during the program?

Resources

- a) Braille Learning frame



- b) Braille learning cube



- c) Braille peg





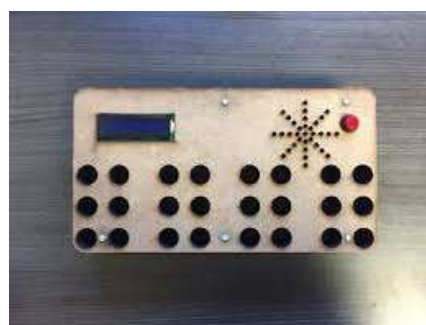
- d) Braille Dot Frame
- e) Braille Books
- f) Hexis Refreshable Braille Reader

Other Braille Products

When education and technology are combined, it provides a concept that could change a person's life regardless of his or her disabilities (Ates, 2013). For visually disabled students, AI-powered braille devices help the children learn and rehearse braille independently. AI can be incorporated into mobile applications and learning platforms and a list of some of the devices are given below;

1. **BraillePad**

BraillePad is an interactive device with which users can quiz their spelling and knowledge of the braille alphabet. BraillePad has four series of holes that each represent a braille cell (Figure 1). BraillePad interacts with the user through auditory cues and an LCD screen. It directs the user to spell out a single letter or four-letter word by placing pegs in the holes that represent a braille dot. When the user places a peg in a hole, BraillePad notifies the user whether the answer is correct. If the answer is incorrect, it gives the user two more chances, then tells them which cells are incorrect, and where the pegs should be placed. BraillePad can interact with the user in English or Tagalog.



Key design criteria that were prioritized in the Braillepad were the device accessibility, portability, durability/reliability, and functional requirements including ease of use, audio

feedback, user engagement, multifunctionality, and efficacy as a braille learning tool. But it is expensive to be had, one costing roughly about 258 CAD (\$179-180).

2. **BecDot**

Expose young children to braille by teaching spelling, letters, and numbers. It is programmable by teacher while enabling self-study/independent use. The BecDot uses four braille cells that react to objects with pre-programmed NFC tags. These NFC tags are programmable stickers that when scanned by a smartphone can trigger pre-recorded or custom text, aiding in object identification.



3. **BrailleBuzz**

Encourages practice with braille characters and phonics. It has audio and tactile feedback and enables self-study (independent use). Shaped as a bumble bee, there are 3 modes of play: phonics, keyboard, and letters. The given letter is heard when the correct combination of dot/keys are pressed. The honeycomb buttons, with braille, speak the letters when pushed.



4. **Read Read**

Developed at the Harvard Innovations Lab, and piloted at the Perkins School for the Blind and the Harvard Graduate School of Education, Readread teaches braille to young, beginning braille learners. It announces letter, position of dots, sound the letter makes to help students learn to decode words and enables independent use. The Read Read™ is accessible to low-vision and blind children, as well as children with multiple disabilities! Simply touch the braille and large-print letter manipulatives and get immediate audio feedback.



5. Slate Master

Slate master is a mobile device didactic tool for the visually impaired designed to ease learning how to use the Braille slate. The Braille slate is a tool used by the visually impaired students or adults to manually write Braille encoded text on paper. Slate Master is composed by a Braille tutor mobile application and a custom input interface that mimics the use of the Braille slate. It has audio feedback and a plastic slate that enables user to interact with smart phone learning app.

6. Taptilo

This teaches braille to young, beginning braille learners with audio and tactile feedback. It has jumbo braille and encourages self-study and structured instruction. This tech connects to an app for teacher to program lessons and track. Just by connecting Taptilo to its app, one can simply select or type a word in the app, and Taptilo will do the translation for you! All instructors can personalize learning materials with Taptilo app. Braille beginners can also customize their learnings by choosing various options.



7. **BrailleBunny**

The BrailleBunny is an inexpensive device compared to 3 other devices written above as well as Annie (Taptilo, Read read & BrailleBuzz). It was developed to promote transferable braille literacy skills including writing with a slate and stylus for children learning to read. The BrailleBunny provides real-time auditory and tactile feedback, and functions in either English or Tagalog (the languages which are taught in the Filipino curriculum). Feedback from 25 children and adults indicated the potential for use within schools in both Canada and the Philippines.



8. **Braille Note takers**

Braille notetakers or tablets are the most powerful and up-to-date **electronic braille devices** in the **assistive technology** industry. Cited to be on the expensive side, they are packed with educational tools that allow students who are **blind** or have a **visual impairment**, to read textbooks, take notes in the classroom, share documents directly to the cloud or with Google Classroom, and send emails



9. Tactopus

Tactopus was founded in 2017 by Chandni Rajendran and Saloni Mehta and is an educational technology startup that aims to create comprehensive learning experiences for learners who are visually handicapped. It is focused on making visually handicapped students learn science and mathematics with the help of tactile graphics, including images that are embossed and textures that can be e-read using fingertips. Tactopus aims to bridge the accessibility gap in education by enabling visually handicapped students to access tools and materials that help them explore and engage with educational content in a multisensory manner. The products comprise tactile books, comprehensive learning kits, flashcards, game boards, and accessible learning apps.



Conclusion

A paper written on the Perception and use of technology within braille instruction by Natalie Martiniello and Walter Wittich, showed results demonstrating that using technology for braille instruction is less often used with seniors than with learners in other age groups, notwithstanding general agreement that technology could provide important motivational and learning advantages. In addition, Rehabilitation Specialists (who typically work with adults and seniors) feel less confident about their level of technological knowledge than TVIs (who work with children and adolescents). Technology is being incorporated less in braille instruction when servicing older clients.

Research Team

Mentor	Teacher / Special educator with experience in teaching Braille to early learners; Subject Matter Experts in technology and literacy
Project Manager	Resource to manage the project design, timelines and deliverables
Research Associate	Researcher on pedagogy and use of technology for learning. Implementation of the program design arrived at.
Braille Expert (VI)	VI / Accessibility consultant to provide perspective of the community and also review, verify and validate the program design and outputs
Content Designer	Resource to design the program's learning content for use in the field as well on Subodha based on the inputs from the mentor, research associate and the Braille Expert