

# CHAPTER I

## INTRODUCTION

### 1.0 Introduction

The present study is entitled “Effect of Tech aided Grade2 Braille (TAG2B) Tutoring System for Students with Visual Impairment”. Braille is a code and this is a system of reading and writing a unique language used by persons with visual impairment. Braille enables persons with visual impairment to read through touch. This study is related to development of Tech Aided Grade2 braille tutoring system. English braille is known as Grade2 Braille. There are three levels in English Braille. Grade 1 Braille is the exact transcription of printed English. Grade2 Braille has contractions which mean English words are abbreviated. Grade 3 is of personal short hands which is not standardized as Grade 1 and Grade 2 Braille. This Grade2 Braille is Contracted Braille system of “short cuts” where one letter might represent an entire word. There are letter combinations, or contractions, that represent whole words without spelling out each letter in the word. Contracted Braille takes up less space and improves an individual’s speed in both reading and writing. Contractions are simply shorthand for words and part-words. Braille uses contractions to facilitate the speed of reading by touch that is strongly correlated to the number of characters in a text and also to reduce the bulk of embossed transcriptions. Braille symbols for contractions can use either one cell or several consecutive cells. Contractions actually save the most effort in reading Braille and in storing embossed Braille. Contractions are generally much easier to learn for both children and adults.

In this study a supplementary tool using technology for learning Grade2 Braille has been developed. This new version of Grade2 Braille has been developed using the software Visual Basic6.0 .The “Visual” part refers to the method used to create the graphical user interface (GUI). The “Basic” part refers to the BASIC (Beginners All-Purpose Symbolic language) in the history of computing. This tutoring system does not require internet as it has been designed on offline mode. Further the tutoring system has three modes viz Learning Mode, Practice mode and Evaluation Mode and thus involves complete instruction for learning Grade2 Braille. The important feature of the study has two stages. stage: 1. Developing Tech Aided Grade2 Braille Tutoring system

and 2. Study the Effect of Tech Aided Grade2 Braille Tutoring system by introducing the same to the students with visual impairment for its application and to Special Education Student Teachers and Special teachers to overview the system and its effectiveness.

In this chapter the details in respect to Prevalence of Visually impaired , Historical Perspectives of Education of Blindness and Low vision, Inclusive Education for the Disabled, Evolution of Braille in India, Inclusive Education for the disabled, Evolution of Braille, Importance of Braille Education, Braille Education for the Visually Impaired, Challenges in learning Braille to Visually Impaired, Contracted and Uncontracted Braille for Visually Impaired, Decline of Braille, Relevance of Braille in the Technological Era, Rationale of the Study, Statement of the Problem, Objectives, Hypotheses, Scope of the study, Delimitations of the Study and Organization of the Study are described.

### **1.1 Prevalence of Visually Impaired**

A large proportion of disabled people are visually impaired. The number of people with visual impairment in the world is nearly 285 million. Among the visually impaired, approximately 39 million people are blind and 246 million have low vision. Developing world contains the largest portion of visually impaired population, which is approximately 90%. Moreover, nearly 19 million children below 15 age group are visually impaired (WHO Media Centre, 2013). According to UNESCO, 90% of disabled children do not have the opportunity to attend school in developing countries (UN, 2013). Less than 3% of the 145 million people with visual impairment living in developing countries are literate. More than 90% of the world's population, 161 million blind and visually impaired people lives in developing communities (WHO 2004).

### **1.2 Historical Perspectives of Education of Blindness and Low vision**

A historical perspective on the progress of educational and rehabilitation services for people with Visual Impairment in India looks at 2 distinct phases: pre-independence (1887-1947) and post-independence (1948 onwards). The early period was marked by the tradition of special schools for people with visual impairment, sponsored by European Christian missionaries. In the post-independence

era, efforts shifted from mere institutional care in special schools to the overall development of students with visual impairment. Also during this period, the Indian government, state governments, and voluntary organizations became active.

Most modern historians agree, however, that modern history of education of person with blindness commenced in 1784 when Valentin Haüy (1745-1822) started educating a small group of blind children and young people in Paris (Lowenfeld, 1973). Following the example set by Haüy in Paris, schools for the blind were established in 1791 in Liverpool, in 1793 in Bristol and Edinburgh, and in 1804 in Vienna, where Johann Wilhelm Klein (1765-1848) founded the famous Imperial School for the Education of Blind Children. Klein was also productive as a writer and publisher, in 1819, of the first extensive textbook on the instruction of the blind. Subsequently, schools for the blind were established in many large European cities.

It was a comparatively long period of time before the model of the first European schools for the blind was emulated and replicated in America. On the East Coast, three private schools for the blind were founded, at almost the same time. The New England Asylum for the Blind (soon to be re-named the Perkins Institution and the Massachusetts School for the Blind) was incorporated in 1829 and opened in July 1832 in Boston; the New York Institution for the Blind was incorporated in 1831 and opened in New York City in March 1832; and the Pennsylvania Institution for the Instruction of the Blind (later re-named the Overbrook School for the Blind) was founded in Philadelphia in 1833. The movement to establish schools for the blind grew as a result of writings of the directors of the newly established schools, and by word-of-mouth as well. Prominent persons, both within and outside the education community, recognized the great educational needs of blind people, and their presence and influence was vital to this growing movement. Once the institutions were established, there developed an informal international exchange of ideas on education and rehabilitation of the blind.

Integration of blind children into regular schools had been a subject of discussion for many years. Dr. Howe, the first director of Perkins School for the Blind, made a firm stand for integration as far back as 1866. In the 1950s a growing number of parents wanted their blind children to be educated in their local schools. Integration in

the 60s would be linked in the United States with the civil rights movement (Silverman, 2000). Parents of children who were blinded by ROP [RLF] played the most important role in bring about a shift in school placement from segregation in residential schools to integration in regular schools with sighted playmates. This change spearheaded the mainstreaming movement for the schooling of children with other disabilities.

Since the early 20th Century, low vision children were thought to destroy their vision by reading normal print or having a close reading distance (Fonda 1970). During the period from 1920 to 1950, many children with low vision were labeled and treated as blind, referred to institutions/schools for the blind, and taught Braille as their reading medium. The practical observation of sight saving teachers was quietly disconfirming the sight use prohibition of the Myopia School advocates.

### **1.3 Evolution of Education of Blind in India**

Significant landmarks in the history of education of the visually impaired in India have been discussed. In 1923, a state level decision was taken to establish a Braille press to produce books in Braille. Due to non-existence of a uniform Braille code for Indian languages, this was not implemented. In 1941, Govt. of India setup a Committee to develop a uniform Braille code for Indian languages. In 1944, they submitted a report on Blindness in India which is the basis of most of the services for the blind today. In 1946, a Cell was setup in the Ministry of Education to promote education, training and rehabilitation of the blind. In November 1950, Development and acceptance of “Bharati Braille”, a common Braille code for Indian languages was finalized, replacing the earlier codes in the light of certain recommendations made by UNESCO. After that the first Braille press at Dehradun in 1951 was Set up. In 1952, marking the beginning of concerted voluntary action in the field, National Association for the Blind was established. In 1957, first Vocational Training Centre for the Adult Blind Women was setup at Dehradun. In January 1959, the first School for the Blind by the Central Govt. at Rajpur, Dehradun (now located in the campus of NIVH, Dehradun) was established. In 1961, Institution of the first Light Engineering course was started at Dehradun. The first National Library for the Blind was established by the Central Government in 1962. After that, Govt. of India brought all its activities for the education, training and rehabilitation of the blind under one umbrella for better

coordination in 1967 called National Centre for the Blind, Dehradun. A review of the Government initiative in 1973-75 to gauge the impact of its schemes for the welfare of the blind led to the decision to set up one apex level Institute in each disability area by the then Ministry of Social Welfare (presently the Ministry of Social Justice & Empowerment). Establishment of the National Institute for the Visually Handicapped (NIVH) on 2nd July 1979.

A paradigm shift was witnessed in 1974 when India launched the Integrated Education for Disabled Children (IEDC) scheme to be implemented through govt. schools. The IEDC Scheme was transferred to the MoE in 1982 and a cell was set up at NCERT, New Delhi which developed into a Department later. The IEDC Scheme attracted many more children following its modification in 1987 and 1992 along with some other measures.

#### **1.4 Inclusive Education for the Disabled**

Inclusive education (IE) is a new approach towards educating the children with disability with that of normal ones within the same roof. It seeks to address the learning needs of all children with a specific focus on those who are vulnerable to marginalization and exclusion. It implies all learners - with or without disabilities being able to learn together through access to common pre-school provisions, schools and community educational setting with an appropriate network of support services. This is possible only in flexible education system that assimilates the needs of diverse range of learners and adapts itself to meet these needs (Inclusive Education in India, (Sanjeev & Kumar, 2007). Providing all students in general education classes with high-quality instructions, intervention, and support is a hallmark of inclusive education (Vorapanya & Dunlap, 2014). Inclusive schools have a collaborative and respectful school culture where students with disabilities are presumed to be competent, develop positive social relationships with peers, and are full participating members of the school community (Jelas & Mohd Ali, 2014; Lamichhane, 2017).

The principle of inclusive education was adopted at the “World Conference on Special Needs Education: Access and Quality” (Salamanca, Spain 1994) and was restated at the World Education Forum (Dakar, Senegal 2000). The idea of inclusion is further supported by the United Nation’s Standard Rules on Equalization of

Opportunities for Person with Disability Proclaiming Participation and equality for all. Of late, a consensus has emerged among Indian intellectuals and pedagogues for adopting inclusive education in mainstream schools.

Inclusion is a process of addressing and responding to the diversity of needs of all children, youth and adults through increasing participation in learning, cultures and communities, and reducing and eliminating exclusion within and from education. It involves changes and modifications in content, approaches, structures and strategies, with a common vision that covers all children of the appropriate age range and a conviction that it is the responsibility of the regular system to educate all children. Complete inclusion in a regular school means were the child is completely an unified part of the existing educational scenario, hardly identifiable at the first glance. India has been working towards legalizing the acceptance of the child with disability through its Acts and Policies over the decades. Yet this has been slow. NCERT with the references of the documents framed by UNICEF has ultimately lead to the development of the National Curriculum Framework for school Education (2005), a contemporary guiding document for School Education in India.

Some of the contemporary developments in the recent decades that have shaped the concept of inclusion in India are:

- 2006: The UN Convention on the Rights of Persons with Disabilities is adopted and ratified by India; however, they did not adopt or ratify the protocol. Article 24 of the Convention discusses the importance of inclusion.
- 2006: The National Policy for People with Disabilities changes special schools into resource centers for people with disabilities and teachers. It also attempts to bridge the service gap between rural and urban areas by creating more District Disability and Rehabilitation Centers.
- 2008: Inclusive Education of the Disabled at the Secondary Stage (IEDSS) replacing the 1974 IEDC.
- 2009: The Right to Education Act, which was originally drafted in 2005, was not passed until 2009, and put into full effect in 2010. The Supreme Court upheld the constitutionality of the act in 2012. This act was not disability specific, but rather included people with disabilities.

## **1.5 Evolution of Braille**

### ***1.5.1 International Efforts for the Education of the Blind***

Prior to the 80's blind people were mainly self-taught, often being given appropriate assistance. France was the cradle of new attitudes towards the blind and started the first school for blind children. The philosophical groundwork was laid by Diderot, an enlightened philosopher and physician to King Louis XV. In 1749, he published 'Letter on the Blind for the Use of Those Who See'. The next giant step was taken in Paris in 1784 by Valentin Haüy when he established the Institution des Jeunes Aveugles (Institution for Blind Youth). Admiration for their competence, not pity for their blindness, was what Haüy hoped to engender for his students. In spite of political upheavals in France and in the life of his school, Haüy's contribution was a lasting one. He founded the first school for blind children, which was to become a model. He emphasized reading and fostered the development of embossed print. Believing in the vocational potential of blind people, he introduced vocational training in his school. Education of the blind children received a further boost by 1834 with the successful adaptation and development of the embossed dot code by Louis Braille, a Frenchman, himself blind. Until this time, blind people did not have an efficient system of reading and writing. Therefore the code which bears Braille's name, still taught around the world, ushered in an era of easier communication among the blind themselves opening the doors for the acquisition of information and knowledge through the sense of touch. Haüy's success led to the establishment of similar institutions in Europe, including the first school for the blind in Liverpool, England, in 1791. Almost half a century after the founding of Haüy's institution, the first school for the blind children was opened in the United States. Three private schools were then started almost simultaneously. They are presently known as Perkins School for the Blind (1829), the New York Institute for the Blind (1831), and Overbrook School for the Blind (1833).

### ***1.5.2 National Efforts for the Education of the Blind***

Braille's beginnings in India can be traced back to colonial times, when British missionaries and bureaucrats introduced and adapted various iterations of Braille, including Oriental Braille, to Indian languages. The growing use of Braille in America and Europe was paralleled in India in the later half of the 19th century, as missionaries

established various schools for the blind at Palayamkottai (1890), Calcutta (1897), Ranchi (1898), Mumbai (1900). However, the lack of a standard approach and script, and the colonial attitude towards educating Indians at the time, limited the spread of Braille literacy.

In 1943 in India, a government-appointed committee prepared a common Braille Code and circulated the same among various provincial Governments and institutions for the blind. When India gained independence in 1947, 11 Braille codes for different regional languages were in use in various parts of the country. The recommendations of this conference led to the development of “Bharati Braille” for the official Indian languages - Hindi, Tamil, Marathi, Gujarati, Bengali, Kannada, Punjabi, Assamese, Malayalam, Nepali, Odia, Telugu & Urdu and its recommendation for nationwide use. The National Institute for the Empowerment of Persons with Visual Disabilities (NIEPVD), then known as the National Institute for the Visually Handicapped, was also deeply involved in the standardization of Bharati Braille. Their Braille Development Unit contributed notation systems for Maths, Music, and Science, as well as Braille contractions, abbreviations, and shorthand systems for most of the official languages of the country.

Braille is often a means for the blind and visually impaired community to foster social bonds and identities, and leverage this into a political voice. Bharati Braille is no different, reaching people irrespective of the language they speak. As Aparna Nair, a historian of medicine and disability, says, “[t]his uniform, universally taught” form of Braille had important effects, including a path to ‘uniting the blind of the whole world who are divided from their fellow sufferers by prejudices of caste, religious customs and manners’. Since the early years, Bharati Braille has earned its place as a vital channel of social inclusion for blind and visually impaired communities.

### ***1.5.3 Bharati Braille: Learning and Communicating***

The languages that we use in everyday life form an important part of how we communicate. So while English Braille remains popular in India, such as for books and employment opportunities, Bharati Braille offers a way for visually impaired people to read and write - and hence share their thoughts and ideas - in the vernacular languages they hear and talk in daily. Classics like Ramayana, Mahabharat, Ramcharitmanas and

Tagore's *Gitanjali* are also available in the script. Bharati Braille has since also been adopted in Nepal and Bangladesh with slight modifications.

It makes sense, then, to have educational opportunities in Bharati Braille too. The common form of English and Bharati Braille also makes it easier to teach multiple languages with a common understanding of the base Braille script and the ways to read, write, and type it. By beginning at primary schooling, Bharati Braille offers a closer linguistic connection to students' immediate surroundings. Since Bharati Braille is based on phonetics rather than the alphabet, it is simpler to connect to sounded words too, opening up multimodal - touch and sound - ways of teaching the script.

Bharati Braille is increasingly the basis for expanding education to more visually impaired learners. The National Education Policy, 2020, makes recommendations in section 6 of the document for "Equitable and Inclusive Education: Learning for All", focused on "foundational literacy and numeracy, access, enrolment and attendance" along with "suitable technological interventions to ensure access can be particularly effective for certain children with disabilities." Alongside directions to make education accessible to children with disabilities through the right resources, it explicitly calls for "adequate and language-appropriate teaching-learning materials," including textbooks in accessible formats such as Braille. The NIEPVD also continues to conduct research towards the propagation and popularization of Bharati Braille, including ways to incorporate the script into higher education.

The advantages of Bharati Braille are clear - and with its rich history, the script is steadily becoming widespread. Perhaps the greatest challenge that remains, then, is ensuring that the people who would most benefit from knowing this accessible and useful script can learn and use it. As the NEP makes clear, alongside the English Braille script, Bharati Braille too can find its place in the education of visually impaired children.

## **1.6 Importance of Braille Education**

Although studies that have looked at the important role of Braille on the lives of students with visual impairment are limited, Braille has been recognized as a valuable and a crucial tool for literacy for people with visual impairment especially in the course

of education. Braille helps students with visual impairment to visualize text through feeling every word of it, learning how these words are written and most importantly it gives students with visual impairment access to material on an equal level to their peers which simultaneously influences their educational achievement and establishes a platform for them to be on a competitive level with others. Indeed many students with visual impairment relate their knowledge of Braille to their competence, independence and equality (F. Schroeder, 1989; F. K. Schroeder, 1996).

A study looking at the vital role of Braille in establishing lifelong literacy was carried out across forty-five cities, towns, and rural communities in eleven eastern and southern American states. Sixty students took part in the study; forty-five were visually impaired and another fifteen from the same schools had no vision impairment. The study revealed that literacy rates of blind high school students who began their Braille education at an early age were consistent with those of their sighted peers. The study also showed that totally blind children who received infrequent or no Braille training, or who began their Braille education at later stages of life, exhibited noticeably lower literacy rates (Ryles, 1996).

### **1.7 Braille Education for the Visually Impaired**

Most 90% of the world's visually impaired people live in developing communities and it is estimated that less than 10% of the blind children in these communities have access to formal education. Braille is a widely-used language that is the only means of literacy for blind people.

Literacy, the ability to read and write, is vital to the quality of life of an individual in today's world. Braille literacy, the ability to read and write Braille letters plays the same role in the life of the visually impaired as print literacy does in the life of sighted persons.

### **1.8 Challenges in learning Braille to Visually Impaired**

Globally Braille was and still is the primary reading method for blind people to access information and education independently. However, many visually impaired (VI), that is those who are blind or partially sighted, find learning to read Braille difficult and its application as a lone intervention raises many problems.

These problems arise from the tactile nature of Braille disadvantaging those with insensitive tips or with multiple and complex needs (McCall & McLinden, 2001) and are compounded during the learning of contracted Braille.

For students who are identified as having braille as their primary learning medium, the need for supports is even greater. Inclusive education places additional demands on braille readers (Ferrell, Mason, Young, & Cooney, 2006) and students with visual impairments who have no additional disabilities should be held to the same academic and social standards as students who are sighted (Holbrook, 2011; Koenig & Holbrook, 2000) (Holbrook & Rosenblum, 2017). Beginning braille readers not only have to learn letters and the rules of basic English grammar as their sighted peers do, but have the added task of learning braille contractions and rules about their use (Emerson, Holbrook, & D'Andrea, 2009). Further, research has shown that braille readers tend to read at a slower rate and experience greater comprehension deficits than print readers do (Dimitrova-Radojchikj, 2015; Trent & Truan, 1997; Wormsley, 1996). Given these challenges, researchers and practitioners are eager to identify evidence-based approaches that address the unique needs of braille readers in inclusive classrooms to support developing reading fluency and comprehension while promoting socialization within the classroom.

## **1.9 Contracted and Uncontracted Braille for Visually Impaired**

Braille is written in tactile cells of six raised dots arranged in two columns and three rows forming thirty-six letters and symbols (Miller 1997). It comes in two main forms, uncontracted and contracted.

### ***1.9.1 Uncontracted Braille***

Uncontracted Braille, which is also called grade one or alphabetical, is an easy and straight forward way to transfer printed words into a tactile format. Each letter converted into uncontracted Braille takes up around the same space as a letter in 24 point Arial font. As a result, uncontracted Braille requires extra time for the reader to process it. Braille script is also available in different languages.

### ***1.9.2 Contracted Braille***

Contracted Braille is a compact form of Braille designed to save reading time and space, making reading Braille more efficient and convenient. It also can be either partially contracted, in which some letters or symbols can represent, alone, a word or a preposition. Or fully contracted, a combination of letters representing words, as well as one symbol can stand for two letters or vowels, for example for “st” or “er”. Additionally, words can be shortened by contracting some of the syllables, for example the word “comfortable” is comprised of three contracted symbols for “com”, “for” and “ble” but individual letters for “ta”.

### ***1.9.3 Contraction and its Types***

Contractions are one of the most important features of Braille and also the one aspect that creates the largest number of special situations for transcribing Braille. However Braille cells have a minimum physical size below which they become difficult to read and this limits a page of Braille just 25 lines of 40 characters. This means that Braille books can become quite bulky. To try and reduce the size of these books and increase the speed at which Braille can be read Grade 2 or contracted Braille was introduced. A contraction is used to shorten the length of a word.

There are several different types of contractions.

- Whole-word Contraction
  - a. Single-cell Whole-word Contraction
  - b. Multiple-cell Whole-word Contraction
- Part-word Contraction
  - a. Single-cell Part-word Contraction
  - b. Multiple-cell Part-word Contraction

**Whole-word Contraction:**

A whole-word Contraction is shorthand for a whole word; whole-word symbols can either one cell or a sequence of cells which can be an abbreviation of a whole-word as single-cell contraction or multiple-cell contraction. A Single-cell word contraction is the uses of one cell either a single-letter or a part-word letter for entire word. Multiple-cell whole-word contraction is by an initial letter contraction for a word that is formed by preceding the single-cell sign for the initial letter or letters of a word

**Part-word Contraction:**

A part-word contraction is shorthand for part of a word, not necessarily corresponding to either a diphthong or syllable. The use of certain part-word contractions is restricted as to placement at the first, middle or end of the word. Proper use of contractions depends to some extent on syllabication and pronunciation.

**1.10 Decline of Braille**

Less than 12 percent school children with visual impairment are using braille William M. Raeder (2006), President of the National Braille Press in Boston. Young students with visual impairment today are still instructed in Braille, but in the past few decades more students have been mainstreamed and no longer receive daily instruction. That is significant, because reading and writing Braille is a skill that needs maintenance. The less often a student uses it, the more likely it is those skills will diminish or even disappear.

The reduction in Braille literacy has been mollified by the fact that there are now more ways than ever for the blind to acquire information. Much of the world is moving away from words on a page and toward electronic/digital information. The explosion of books on tape means people with visual impairment no longer have to wait to read the latest bestseller. Talking computers have brought the blind to the world and the world to the blind. These advances have placed a generation of blind young adults and children in an information paradox: they have more knowledge at their disposal, while their ability to read and write declines.

But proponents of Braille always fall back on the same argument: if reading and writing are important to the sighted, they are important to the blind. “If the literacy rate for sighted people was 10 percent, that would be a huge issue”

### **1.11 Relevance of Braille in the Technological Era**

Braille code was created in the 1800s and technology has advanced, sometimes it is hard to grasp its relevance in this technological era. People might think that with the increase in audio technology like personal assistance, voice output, audio books and other electronic technology, why would a person with visual impairment need to use braille anymore. Braille represents literacy and it is used every day by the persons with visual impairment. It is in the most common places such as; a public bathroom sign indicating male or female. Braille is also found on elevator panels, bus stop signs, ATMs and hotel room panels. Some national chain restaurants offer braille menus upon request. In board games or with Legos, braille creates more accessible playtime.

Since braille is a reading and writing system, initially it was available in book format only. But today the person with visual impairment can use electronic braille devices. They can connect a refreshable braille display to computers, smartphones and tablets to fully access braille without being loaded down with a bulky heavy book. There is no need to lug around that favorite bestseller in multiple volumes anymore.

Using braille to label items helps with organization and increases independence reducing the need to constantly ask for sighted help. Some people make braille note cards to label canned goods in their kitchen pantry or file folders in a drawer at work. Others find it handy to use when giving a speech or presentation and even create Braille labels to arrange CDs, DVDs and other items in a home or office. Braille is key for children with visual impairment. The list is endless of the myriad ways that braille can be used and the relevance it still has today.

### **1.12 Rationale of the Study**

Among the many learning challenges faced by students with visual impairments, the development of literacy is particularly problematic. Recent research suggests the literacy rates for visually impaired students have decreased considerably in recent years, while the visually impaired population has grown (Braille Institute, 2010).

Estimates by the National Braille Press suggest that only 12% of legally blind individuals can read braille, which is a substantial decline from the 50% of reported braille readers in the 1960s (Brittain, 2007). The braille code is one means of developing literacy for blind individuals in which each letter and number of the English alphabet is represented by a unique tactile symbol. Each symbol is composed of the presence or absence of a raised dot in up to six locations in a cell comprised of two columns and three rows. Each dot is approximately 1 mm in diameter, and there is approximately 1.5 mm between the midpoints of each dot location within a standard cell. Each word of the English language can be transcribed into braille with a point-to-point correspondence between the text letter and the braille symbol.

Along with the decline in literacy rates, classroom-based braille instruction has decreased over the past several decades. In 1968, 40% of students with visual impairment enrolled in elementary and secondary education were reported to be reading braille, but in more recent years these estimated levels dropped to between 9% and 22% (Braille Institute, 2010; Department of Field Services of the American Printing House for the Blind, 2009; National Federation of the Blind, 2009). Some have suggested that individuals with visual impairment may be less reliant on braille due to the increased availability of large-print books and advances in technology that make auditory media more available and accessible (Johnson, 1996). Although technology may replace the need for braille literacy under some circumstances, the complete omission of braille literacy may limit individuals' opportunities for independence throughout life (e.g., braille is often available in public places such as elevators and ATMs, and much of the current technology is not transportable). (Ryles, 1996) reported that adults who were congenitally legally blind and were taught braille as their first means of literacy had higher employment rates, higher educational levels, and better financial stability, on average, than adults with similar disabilities but who were first taught as large-print readers.

In addition to technological advances, several sources have suggested that declining braille instruction is attributable, in part, to a deficit in qualified braille instructors (Bell, 2010; Johnson, 1996; Mason & Davidson, 2000; Ponchillia & Durant, 1995) National Federation of the Blind, 2009, the use of general education teachers with no braille training as braille instructors (Johnson, 1996), a lack of training

programs, and different standards of qualification in those programs that do exist (Amato, 2009). Standards for training instructors of the visually impaired differ considerably among states.. There is a general consensus that an instructor needs to be able to read braille, both for rapid prompting and correcting during instruction and to create instructional material (Bell, 2010; Pierce, 2006).

The traditional approach to teaching braille is to teach tracking and pre-literacy (or pre-braille) skills, then move to the alphabet, alphabet words, short-form words, contractions, and then final-letter contractions. This method is very time consuming before the student can successfully read grade-level materials. This method goes against the adaptability needed for a diverse population of readers presented in a multi-case study of reading (Vaughn, 2019) In a traditional school setting it can take years to advance their reading ability to a rate competitive with their sighted peers. Braille readers lack the incidental learning print readers receive daily through environmental print. Teachers of the blind must orchestrate opportunities for the braille reader to experience these learning moments throughout the curriculum. Many of the current programs for teaching young braille readers isolate them into a separate curriculum where they are not experiencing the same learning environment as their sighted peers. These programs not only isolate the student from their sighted peers, they are often not motivating and contain unauthentic learning activities for the student. All highly effective reading programs had certain characteristics that distinguished the program as highly effective and motivating was one of those characteristics (Gambrell & Marinak, 2009). The teacher of the blind must create meaningful, authentic activities across the curriculum motivating the student to interact with the curriculum while learning braille. Relevance provides the motivation to want to learn to read even when students have previously been unsuccessful (Wormsley, 2011).

The Individuals with Disabilities Education Act amendments of 2004 (USA) recognized the importance of assistive technology devices for students with disabilities. Individual Education Plan teams must appropriately consider the complete range of devices and services available to students with visual impairment because the devices may affect the development of students' self-confidence and self-esteem. Also, students trained in the skills necessary to cope with their disability-specific needs by using assistive technology devices are increasingly capable of participating fully with their

nondisabled peers in general education settings (Educating blind and visually impaired students, 2000).

Though it is known that teachers are trained to teach pupils in schools and conduct lessons every day, teaching pupils with visual impairment constitutes a challenge for teachers (Simalalo, 2006). Pupils with visual impairment require alternative forms of teaching and learning methods. This includes the use of Braille to read and write and other assistive devices that increase accessibility to education. One of the most important skills when learning Braille is that it is such a unique skill to have. However in today's context pupils with visual impairment are deprived of Braille reading skills. The World Blind Union strongly recommends that all blind and severely partially-sighted children be given the opportunity to learn and become proficient in Braille reading and writing skills and they receive instruction from those who are thoroughly trained and qualified to teach Braille. Braille can be written using individual letters of the alphabet, and this is known as Grade 1 or uncontracted Braille. It can also be written using contractions or Grade 2 Braille. It is quick, simple and can be faster to read than grade 1 Braille. Unlike the eyes, the fingers cannot be taught to take in a whole line at a glance. The information is put into smaller packages. If the child can run her fingers over the letter c and read the word "can," or the letter l and read the word "like," she can, in a sense, absorb information at a tactile glance. Reading a whole-word contraction is quicker than having to read "c-a-n" or "l-i-k-e. Contractions save time and space because Braille is big and takes up more space than standard print. Contractions also make reading and writing Braille much faster. Most braille, like books, signs in public places, menus, and most other braille materials, are done in Grade 2. Teaching contracted Braille from the beginning was recommended (Heather Field, 2012). The amount a child can read is limited to the number of actual dots he/she can get under the fingertips at a given time.

Considering the present context, a survey of literature related to technology aided Grade 2 Braille was explored in Indian context. It focused to find a self-learning tool for Braille. Hence an attempt was made to develop technology based Grade 2 Braille Tutoring System which intended to provide three modes viz., Learning Mode, Practice Mode and Evaluation Mode. The newly developed tech aided system is for

independent use for visually impaired persons and teachers and anyone interested to learn Braille.

### **1.13 Statement of the Problem**

The statement of the problem is worded as: “*Effect of Tech Aided Grade2 Braille (TAG2B) Tutoring System for Students with Visual Impairment*”.

### **Definitions and Terms Used in the Study**

#### ***Braille***

Braille is a system of embossed signs which are formed by using combinations of six dots, arranged and numbered.(Wikipedia)

#### ***Uncontracted or Grade 1***

It is the simplest form which consists of fully spelt words, punctuation, numbers and composition signs. It is only used by people who are first starting to read Braille.

#### ***Contracted or Grade 2***

Grade2 consists of the standard letters of the alphabet, punctuation and contractions. The contractions are employed to save space because a Braille page cannot fit as much text as a standard printed page. Books, signs in public places, menus, and most other Braille materials are written in Contracted Braille. (Wikipedia).

- **Simple sign** - a sign occupying one cell only.
- **Composite sign** - a sign occupying two or more cells.
- **Upper sign** - a sign containing dot 1, or dot 4, or both.
- **Lower sign** - a sign containing neither dot 1 nor dot 4.
- **Contraction** - a sign which represents a word or a group of letters.
- **Groupsign**- a contraction which represents a group of letters.
- **Wordsign** - a contraction which represents a whole word.
- **Shortform**- a contraction consisting of a word specially abbreviated in Braille

### **Grade 3**

It is the next version of Grade 2. It is mainly used in personal letters, diaries, and notes and also in literature to some extent.

### **Braille Technology**

An assistive technology which allows blind or visually impaired people to do common tasks such as writing, browsing the Internet, typing in Braille and printing in text, engaging in chat, downloading files, music, using electronic mail, burning music, and reading documents. It also allows blind or visually impaired students to complete all assignments in school as the rest of sighted classmates and allows them take courses online. It enables professionals to do their jobs and teachers to lecture using hardware and software applications. (Wikipedia)

### **Visual Impairment**

- a) “Blindness” means a condition where a person has any of the following conditions, after best correction-
  - i. total absence of sight; or
  - ii. visual acuity less than 3/60 or less than 10/200 (Snellen) in the better eye with best possible correction; or
  - iii. limitation of the field of vision subtending an angle of less than 10 degree.
- b) “low-vision” means a condition where a person has any of the following conditions, namely:- (i) visual acuity not exceeding 6/18 or less than 20/60 upto 3/60 or upto 10/200 (Snellen) in the better eye with best possible corrections; or (ii) limitation of the field of vision subtending an angle of less than 40 degree up to 10 degree.

- RPWD Act (2016)

### **1.14 Objectives**

The objectives of the study were to:

1. Develop Tech Aided Grade2 Braille Tutoring System to enhance Braille literacy of students with visual impairment.
2. Study the effect of Tech Aided Grade2 Braille Tutoring System by introducing it to the students with visual impairment.

3. Compare the test mean scores of Grade2 Braille obtained by the Students with visual impairment before and after introduction of Tech Aided Grade2 Braille Tutoring System.
4. Compare the Progress Monitoring scores of Grade2 Braille obtained during the course of intervention.
5. Rate the effectiveness of the Tech Aided Grade2 Braille Tutoring System by introducing it to the In-service and Pre-service teachers.
6. Study the influence of Gender on learning of Grade2 Braille with Tech Aided Grade2 Braille Tutoring System.
7. Study the influence of Grade on learning of Grade2 Braille with Tech Aided Grade2 Braille Tutoring System.

### **1.15 Hypothesis**

The null hypotheses selected for the study:

1. There is no significant difference in the mean scores of Grade2 Braille obtained by the students with Visual Impairment before and after introduction of Tech Aided Grade2 Braille Tutoring System.
2. There is no significant difference in the mean scores of Alphabet Word Sign before and after introduction of Tech Aided Grade2 Braille Tutoring System
3. There is no significant difference in the mean scores of Strong Words before and after introduction of Tech Aided Grade2 Braille Tutoring System
4. There is no significant difference in the mean scores of Lower Signs before and after introduction of Tech Aided Grade2 Braille Tutoring System
5. There is no significant difference in the mean scores of Dot-5 Initial Letter before and after introduction of Tech Aided Grade2 Braille Tutoring System
6. There is no significant difference in the mean scores of Dot 4,5 Initial Letter before and after introduction of Tech Aided Grade2 Braille Tutoring System
7. There is no significant difference in the mean scores of Dot 4,5,6 Initial Letter before and after introduction of Tech Aided Grade2 Braille Tutoring System
8. There is no significant difference in the mean scores of Final Letter before and after introduction of Tech Aided Grade2 Braille Tutoring System

9. There is no significant difference in the mean scores of Short Form Words before and after introduction of Tech Aided Grade2 Braille Tutoring System
10. There is no significant difference between Boys and Girls in the scores of Grade2 Braille Contractions before and after introduction of Tech Aided Grade2 Braille Tutoring System
11. There is no significant difference among different Grades in Grade2 Braille Contractions before and after intervention introduction of Tech Aided Grade2 Braille Tutoring System

### **1.16 Scope of the Study**

- Tech aided Grade2 Braille Tutoring System has universal design feature and thus be useful to any learner.
- Tech aided Grade2 Braille Tutoring System once developed can be used ‘n’ number of times and by ‘n’ number of learners.
- Tech aided Grade2 Braille Tutoring System has three modes namely Learning, Practice and Evaluation and thus has holistic software system.
- It can be used on offline mode and does not require internet facility.
- Tech aided Grade2 Braille Tutoring System has scope for further development of advanced software system for Grade2 braille

### **1.17 Delimitations of the Study**

- Due to scarcity of sample, the study is restricted to only experimental group and no control group
- The present investigation being an Experimental study was confined to 42 samples.
- The demographic variable used in the study is restated to Gender only due to non-availability of sample as stated in the inclusion and exclusion criteria.
- The study was confined to only Coimbatore district in Tamil Nadu
- The study was confined to students with total vision impairment.

### **1.18 Organization of the Study**

The present study on “Effect of Tech aided Grade2 Braille tutoring system for students with visual impairment” is organized and presented under the following chapters.

**Chapter I** The first chapter presents Introduction, Prevalence of Visually impaired, Historical perspectives of blindness and low vision, Evolution of Education of the blind in India, Inclusive Education for the disabled, Importance of Braille Education, Importance of Braille Education, Braille education for the visually impaired, Challenges in teaching braille to visually impaired, Contracted and uncontracted Braille for visually impaired, Decline of Braille, Relevance of Braille in the technological era, Rationale of the study, Statement of the problem, Objectives, Hypotheses, Scope of the study, Delimitations of the study and Organization of the study.

**Chapter II** The second chapter presents the review of literature related to the present study.

**Chapter III** The third chapter illustrates the research procedure which includes designing and development of ‘TAG2B’ software and it’s experimentation with visually impaired students, construction of tool, selection of samples, administration of tools and data collection procedure.

**Chapter IV** The fourth chapter deals with the tabulation, analysis and interpretation of data in detail.

**Chapter V** The fifth chapter reports the findings, recommendations and suggestions. This is followed by bibliography and appendices.

The review of related literature is presented in the next chapter.