RESEARCH-ARTICLE

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Published: 26 October 2025

Citation in BibTeX format

ASSETS '25: The 27th International ACM SIGACCESS Conference on Computers and Accessibility
October 26 - 29, 2025
Colorado, Denver, USA

Conference Sponsors:
SIGACCESS

https://doi.org/10.1145/3663547.3746392
ISBN: 9798400706769

Generative AI for Teachers with Vision Impairments in the Global South: A Bridge Too Far?

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Abstract

Multimodal generative artificial intelligence (GenAI) offers new affordances for inclusive education, particularly for children with vision impairments (CVIs), by enabling alternate representations that align with non-visual mental models. While GenAI tools are rapidly reshaping mainstream educational practices worldwide, their design and deployment often presume a digitally literate, sighted teaching workforce and well-resourced institutional contexts. In this paper, we address a critical gap in HCI and accessibility research: the near-total absence of empirical studies on teachers with vision impairments (TVIs), who play a central pedagogical role in schools for the blind across the Global South. Through in-depth interviews with 15 TVIs in Karnataka and a nationwide survey of 105 TVIs across 15 Indian states, we surface the everyday teaching practices, technological aspirations, and systemic constraints that shape their engagement with digital technologies, including GenAI. Our findings reveal a disjuncture between the potential of GenAI and the readiness of the institutional and infrastructural ecosystem in which TVIs operate. We document pervasive challenges, including limited access to devices and connectivity, insufficient training, resistance from school management, and entrenched barriers to STEM education, while also highlighting sites of resilience, innovation, and professional commitment. This study advances the HCI discourse by centering disabled educators as key agents in the design of accessible educational futures. We argue that realizing GenAI's inclusive potential requires moving beyond assistive technology retrofits toward co-designed, contextually grounded systems that respond to the lived realities of TVIs in the Global South.

CCS Concepts

• **Human-centered computing → Empirical studies in accessibility**; **Empirical studies in HCI**.

ACM Reference Format:
Manohar Swaminathan and Tarini Naik. 2025. Generative AI for Teachers with Vision Impairments in the Global South: A Bridge Too Far?. In *The 27th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '25), October 26–29, 2025, Denver, CO, USA*. ACM, New York, NY, USA, 18 pages. https://doi.org/10.1145/3663547.3746392

ASSETS '25, Denver, CO, USA

ACM ISBN 979-8-4007-0676-9/25/10
https://doi.org/10.1145/3663547.3746392

1 Introduction

Recent advances in generative artificial intelligence (GenAI), particularly in large language models (LLMs) and their multimodal capabilities have led to a proliferation of tools with applications across domains including education, accessibility, and communication. With the launch of scalable systems supporting text, audio, image, and video inputs and outputs, GenAI now offers compelling affordances for reimagining how people learn, teach, and interact with information across languages, modalities, and contexts.

In education, GenAI is rapidly gaining traction. Developers and researchers are exploring its promise to provide adaptive, personalized, and scalable learning interventions at all levels — from early childhood to adult education and lifelong learning. While mainstream discourse includes legitimate concerns around misinformation, equity, and dependency, much of the narrative remains optimistic, highlighting tools that can act as intelligent tutors, assessment assistants, or creative collaborators. Yet, as these technologies continue to shape the future of education, critical questions arise about who is being served and who is being left behind. The inclusive potential of GenAI remains largely speculative for people with disabilities (PwDs), despite early promising applications. For instance, tools such as Be My AI [16], which uses image captioning powered by multimodal LLMs, have provided blind and low-vision users with an unprecedented degree of independence in everyday tasks. However, there remains a significant gap in exploring how GenAI might serve more complex, situated educational needs, particularly for children with vision impairments (CVIs) and teachers with vision impairments (TVIs).

Our focus in this paper is on a critical yet under-examined stakeholder group in accessible education: TVIs working in schools for the blind in India. This group plays a vital mediating role in shaping the educational opportunities of CVIs, yet has received minimal attention in prior work on assistive technology, inclusive pedagogy, or HCI for accessibility.

India is home to the world's largest population of CVIs [23, 48]. These children often study in resource-constrained residential schools for the blind, which differ significantly from inclusive or mainstream education environments. Teachers, many of whom are themselves blind or low-vision, often manage multi-grade classrooms with minimal support and limited access to infrastructure, teaching materials, or digital tools. The conditions of these schools have been further exacerbated by historical patterns of technological exclusion, as seen during the COVID-19 pandemic, when CVIs across the country experienced significant learning loss due to the inaccessibility of online education systems.

Despite the central role of teachers in these settings, there is little empirical work examining their pedagogical practices, technological aspirations, or lived experiences with computing. Existing literature on technology integration in Indian classrooms rarely includes special schools, and even less so the experiences of TVIs. Research on disability and assistive technology in the Global South similarly continues to be sparse, often failing to engage with the material, infrastructural, and sociocultural realities that shape the design and deployment of technology for marginalized users.

In this work, we position TVIs in schools for the blind in India as critical agents in the broader effort to make GenAI and computing technologies more inclusive and locally relevant. Our study investigates both the readiness and the capacity of TVIs to adopt GenAI technologies, and the socio-technical constraints that shape this potential. We ground our investigation in the following research questions:

- **RQ1: What is the readiness of TVIs, and their capacity to leverage computing technologies—including GenAI—to enhance their effectiveness as teachers in schools for the blind?**
- **RQ2: What are the barriers and opportunities in the school environment and the broader socio-technical context that influence their ability to integrate such technologies into their teaching practice?**

By foregrounding the perspectives of TVIs in India, our work contributes to a growing body of HCI4D and accessible computing scholarship that calls for inclusive, situated, and participatory approaches to technology design. We argue that without proactive efforts to center the voices of educators with disabilities—particularly in the Global South—emerging educational technologies risk reproducing longstanding patterns of exclusion, rather than dismantling them.

2 Related Work

This section reviews current literature on GenAI in education and its emerging applications for people with visual impairments (PVIs). We first outline the broader landscape of AI-powered educational tools, before turning to the growing ecosystem of assistive AI technologies for blind and low-vision users. We then examine how these developments intersect with structural barriers in the Global South, with a particular focus on CVIs and TVIs.

2.1 AI in Education

The transformative potential of GenAI in education has captured the attention of researchers, startups, and large technology companies alike. A broad spectrum of applications has emerged, ranging from intelligent tutoring systems and automated assessment to content generation, personalized feedback, and multi-modal learning experiences. For example, tools like Khanmigo-ai [1], GenAI assistant developed by Khan Academy using GPT-4 are designed to scaffold student understanding and support teacher workflows through dynamic interactions [42, 46]. Similarly, platforms like Duolingo Max [13] leverage GenAI to deliver personalized language learning, while Memrise [24] (UK) enhances language acquisition through AI-driven spaced repetition and native speaker interactions. In the early education space, Amira Learning [2] and DreamBox Learning [12] (USA) focus on foundational literacy and numeracy, using AI for real-time feedback and adaptive lesson pathways. Solutions such as Sana Labs [43] (Sweden) and Carnegie Learning [5] (USA) enable adaptive assessments and personalized feedback loops to support diverse learners.

From the Global South, startups like Teachmint [51] and Unacademy [52] (India) are developing AI copilots tailored for classroom management and instructional support, particularly in resource-constrained settings, while Squirrel AI [47] (China) pushes the boundaries of AI-powered adaptive tutoring at scale. Finally, Riiid [41] (South Korea) exemplifies the growing ambition of Global South-oriented innovation from technically advanced economies, with AI-driven personalized assessments for standardized test preparation, expanding access to learners worldwide. Collectively, these developments illustrate the global and rapidly evolving landscape of AI-driven educational tools, shaping the future of learning environments around the globe.

2.2 AI for People with Visual Impairments

Alongside mainstream educational tools, there is early evidence that GenAI can offer powerful affordances for PVIs when designed with accessibility in mind. For instance, Be My AI [16], an application built on the Be My Eyes [4] platform and powered by GPT-4V, enables PVIs to receive conversational descriptions of images, transforming their access to visual information in everyday contexts. Similarly, tools such as Seeing AI [25] and Google LookOut [19] extend these capabilities with object recognition and text reading in the physical environment.

A growing ecosystem of AI-powered tools offers support across multiple aspects of daily life for PVIs. For navigation and spatial awareness, apps like RightHear [40] provide real-time audio guidance, enhancing mobility in unfamiliar environments. Tools such as Envision AI [15] and Supersense [50] integrate image recognition and text scanning, enabling users to interpret their surroundings and read printed materials. Meanwhile, Voice Dream Scanner [59] focuses on document reading and text-to-speech conversion, supporting information access. Assistive platforms like OrCam MyEye [33] offer wearable solutions that combine text reading, face recognition, and object identification. Finally, AI-driven assistants like ChatGPT [32] are increasingly adopted for general-purpose conversational support, helping users generate text, answer queries, and navigate digital environments.

However, despite this promising diversity, the majority of these tools are predominantly designed for everyday living rather than formal educational contexts. More critically, they largely assume a baseline of technological familiarity, device access, and digital literacy that many PVIs in the Global South and under-resourced communities worldwide, including marginalized groups in the Global North, do not have. Globally, PwDs, including those with visual impairments, are disproportionately affected by poverty and digital exclusion. According to UNICEF, nearly half of PwDs worldwide live in poverty, and over two-thirds of people in low-income countries lack reliable internet access [54]. The World Bank similarly reports that low- and middle-income countries face acute shortages of assistive technologies, accessible digital learning materials, and inclusive training opportunities for both learners and educators with disabilities [60]. These deficits are particularly severe in rural areas, where compounded infrastructural and socio-economic barriers further isolate PVIs from the benefits of emerging technologies. As a result, despite the growing ecosystem of assistive AI tools, substantial global divides remain in terms of access and usability, limiting the potential of these technologies to reach PVIs in under-resourced contexts.

2.3 AI for Teachers with Visual Impairments

Beyond learners, the role of TVIs remains largely invisible in the current GenAI landscape. Most studies of GenAI in education, whether technical, pedagogical, or policy-focused, implicitly assume a sighted teacher working in a well-resourced classroom [36]. In the Global North, where inclusive education is the norm, CVIs are typically supported by sighted general educators alongside special educators, who may or may not have disabilities themselves [55]. As a result, the figure of a TVI, especially in a leadership role in the classroom, remains largely absent from both scholarly and industry discourses.

In contrast, in India and other parts of the Global South, the educational landscape for children with disabilities is shaped by markedly different institutional and social configurations [14]. A large proportion of CVIs in India attend residential schools for the blind, many of which are underfunded, teacher-constrained, and reliant on philanthropic or non-governmental support. In these schools, a significant fraction of teachers are themselves blind or low-vision, having progressed through similar educational systems as their students [14, 35]. These teachers form a unique pedagogical community, deeply invested in accessibility not as an add-on, but as an existential necessity.

Adults in India rely on a range of assistive technologies, including screen readers such as JAWS [44], NVDA [31], mobile screen readers like TalkBack [20], and refreshable braille displays like the Orbit Reader [45]. AI-enabled tools such as Envision AI and Eye-D support object recognition and text scanning [45], while mainstream platforms like WhatsApp, Google Meet, and Zoom have enabled lesson delivery and peer collaboration, particularly during the COVID-19 pandemic [9, 45]. While prior work in assistive technologies has largely focused on personal or workplace use, including how college TVIs use such tools [45], there remains limited exploration of how TVIs in school settings integrate assistive technologies into their teaching. Much of the existing educational research centers on learners with disabilities, often overlooking the experiences of educators as active users and mediators of technology in the classroom. Within HCI4D and educational technology scholarship, attention has predominantly been directed toward infrastructural deficits and student-level divides [8, 10, 22, 29], with some focus on the challenges faced by teachers in low-resource settings more broadly [56–58], yet often neglecting the distinct and compounded barriers experienced by educators with disabilities.

Structural barriers further constrain TVIs' engagement with technology, beginning early in life and persisting into their professional roles. Prior studies on Indian classrooms identify infrastructural deficits, lack of training, limited access to devices, and insufficient localized content as persistent challenges [29]. The World Bank highlights that many schools in low and middle income countries lack not only assistive technologies but also the necessary teacher training for disability-inclusive education [60], compounding these barriers. Even where broader studies examine these constraints, they rarely focus on educators with disabilities in special schools, reflecting a broader tendency in HCI and education research to conflate accessibility with student accommodations, rather than examining the wider ecosystem of educators with disabilities, administrators, and technologists.

Our work addresses this critical gap by foregrounding the lived experiences and technological practices of TVIs in India. By centering educators as both users and co-constructors of accessible learning environments, we contribute to ongoing conversations in HCI, accessibility research, and AI-enabled education about inclusive design and equitable technology futures.

3 Study Design

We conducted a mixed-methods study to examine the technology usage, preferences, and practices of TVIs in Karnataka classrooms, and to investigate whether these patterns held across other regions in India. Our approach integrated in-depth, semi-structured interviews with TVIs in Karnataka and a follow-up national survey of TVIs across 15 states. Ethical approval for this research was obtained from the Institutional Review Board (IRB) at Microsoft Research.

3.1 Procedure

The study was conducted between March 2024 and January 2025. Ethical protocols were developed in close consultation with our Ethics Review Board to ensure accessibility and clarity for participants. Recruitment messages for the interviews were circulated in both Kannada and English to enable clear communication with potential participants. For the survey, we ensured screen reader compatibility and provided the questionnaire in seven languages to accommodate the linguistic diversity of TVIs across India. For the interview study, we recruited 15 TVIs from 10 schools across Karnataka through Vision Empower Trust (VE), a non-profit organization supporting inclusive education for CVIs. We employed in-depth, semi-structured interviews to capture rich narratives about participants' teaching practices and technology use. Interviews were held in person (5 participants in Mysore) or virtually (10 participants via Google Meet or Microsoft Teams), based on participant convenience, and lasted between 45 and 120 minutes. The participants were remunerated with an INR 1000 (~12 USD) Amazon gift voucher for participation. Three volunteer interpreters, proficient in Kannada, supported the interviews. While the interpreters were not professionally trained, both interviewers had a working understanding of Kannada, facilitating effective communication. The interviews were transcribed and translated collaboratively by two authors with assistance from a native Kannada speaker.

At the conclusion of each interview, we introduced ChatGPT [32] and Be My AI [16], offering demonstrations and explanations of their potential relevance to classroom teaching. This was for two reasons: First, to understand their level of awareness of emerging technologies including GenAI, and second, to provide them with some tangible new knowledge as possibly an additional benefit beyond the participant compensation. We included Be My Eyes in the demonstrations as it is a widely recognized accessibility tool with a GenAI-powered upgrade, Be My AI. Our NGO partner, VE, had conducted introductory sessions on Be My Eyes in some schools, and we anticipated some level of prior exposure among participants. Approximately 20 days later, we conducted follow-up calls averaging 20 minutes to understand participants' experiences using these tools in their practice. Out of 15 participants, 14 responded to the follow-up, with one participant unreachable due to scheduling conflicts. This step was to get some preliminary data about their situated context in utilizing such knowledge.

Building on themes identified in the qualitative phase, we developed a 46-question survey using Microsoft Forms. The survey included both closed and open-ended questions, and was iteratively refined with feedback from accessibility experts. Accessibility considerations were central to the design, with the survey made screen reader compatible and multilingual. We distributed the survey through VE's WhatsApp groups and direct outreach to approximately 407 TVIs within VE's network of 150 schools across 17 states. We received 110 responses from TVIs spanning 15 states. Of these, 5 participants did not provide consent to use their data, resulting in 105 valid responses, yielding a response rate of approximately 26%. While Karnataka accounted for the largest number of survey responses—aligning with our interview study's location—we observed variation in participation across states. These variations reflected structural differences in VE's network, including the uneven distribution of TVIs relative to sighted teachers in the schools for the blind across different state. One survey question about teacher salaries was added later in the deployment process, based on early participant feedback. As a result, only a subset of respondents—55 out of 105—saw and answered this question. Additionally, we kept the question optional, recognizing that some TVIs may be uncomfortable disclosing salary details.

3.2 Participants

Our interview participants included 15 TVIs, comprising 10 women and 5 men (Table 1), with varying levels of visual impairment: 9 were totally blind, and 6 had low vision. Participants taught across multiple grade levels, with 9 participants handling six or more grades. Many also taught multiple subjects: 10 taught three or more subjects, including English (9), Mathematics (8), Kannada or Hindi (6), Social Science (7), Science (5), Braille (3), and one teacher each for Computer Science, EVS, and Mobility/Sensory Training. Teaching experience ranged from less than 5 years to over 15 years: 2 teachers had less than 5 years of experience, 3 had 6–10 years, 4 had 11–15 years, and 6 had more than 15 years of experience. Survey participants were recruited through VE's outreach efforts, covering TVIs in 15 states. Detailed participant demographics are presented in Table 2.

3.3 Data Analysis

We followed an exploratory sequential mixed-methods design [7], beginning with in-depth qualitative interviews to uncover key themes, which informed the development of our pan-India survey. The qualitative and quantitative datasets were analyzed independently to maintain methodological rigor, and the findings were compared at the interpretation stage to surface reinforcing patterns, contradictions, and new insights.

To analyze our qualitative data, we used thematic analysis [6] to uncover emerging themes from the interview transcripts. The interview data was subjected to open coding, and the resulting codes were organized into categories to understand user behavior. Two authors collaboratively conducted the coding process, refining the codes through multiple iterations until they reached a consensus. During the analysis, they strategized the coding approaches, created initial codebooks, reviewed and revised them, adjusted the codes as needed, and ultimately surfaced core themes such as: 'adaptation and use of technology across teaching tasks', 'systemic and infrastructural constraints', 'institutional norms and support networks', and 'individual motivations and barriers to digital engagement'.

Survey data analysis employed descriptive statistics, including frequencies, percentages, and cross-tabulations to explore relationships between workload, technology adoption, and teaching experience. Analyses were performed manually using Python in Google Colab, and the results were manually exported for integration into our overall study findings. While the survey findings were analyzed separately from the qualitative data, they served to examine whether themes identified in the Karnataka interviews were reflected across other states, or if regional variations emerged. To enable this cross-state comparison, we organized our analysis by state. In India, each state operates under its own education board and administrative framework, which impacts curriculum, resource allocation, and teacher training. Furthermore, disability education is handled by different departments across states, including the Department of Education in some and the Department of Welfare in others. This state-wise lens helped surface systemic and contextual differences in how TVIs engage with technology.

3.4 Limitations

In India, schools for the blind typically employ a mix of TVIs and sighted teachers. However, the composition of staff varies considerably across schools, with some having more sighted teachers than TVIs, and others the reverse. Since our survey recruitment was conducted through VE's network of schools, the distribution of responses may have been influenced by these varying staff compositions. Some schools in VE's network have a higher concentration of TVIs, while others have fewer, leading to an uneven representation of TVIs across states in our survey data. This variation limits the generalizability of our national-level insights.

4 Findings

To answer our research questions, we present findings across five key dimensions: (1) the current role of technology in teaching, (2) systemic challenges within schools for the blind, (3) the broader institutional and social landscape, (4) teachers' motivations and attitudes, and (5) emerging awareness of GenAI. These themes offer an in-depth account of both the individual readiness and capacity of TVIs to adopt computing technologies (RQ1), and the broader sociotechnical and institutional barriers that shape their integration into teaching practice (RQ2). We follow these qualitative insights with a dedicated survey analysis to examine the extent to which these patterns hold across states.

Table 1: Demographic details of the interview participants. (Legend—Govt.: Government; Pvt.: Private; EVS: Environmental Studies; SS: Social Science)

ID	School Type	Sex	Vision Status	Exp (yrs.)	Subjects Taught	Grades Taught
P1	Pvt.	F	Totally blind	>15	Math, SS, Braille, Computer	1,2,3,4,5,6,7
P2	Pvt.	F	Totally blind	<5	English, Math	1,2,3,4,5,6,7
P3	Pvt.	M	Low vision	<5	English, Kannada, Hindi, EVS, Math	1,2,3,5,6,7
P4	Govt.	F	Low vision	6-10	Math, Science, Sociology, SS	1,2,3,4,5,6,7,8,9,10
P5	Govt.	F	Totally blind	>15	English, Kannada	1,2,3,4,5,6,7
P6	Pvt.	F	Totally blind	11-15	Math, Science, SS, Braille, Kannada, English	1,2,3,4,5,6,7,8,9,10
P7	Pvt.	F	Totally blind	>15	Math, SS, Mobility/Sensory Training, EVS	1,2,3,4
P8	Pvt.	F	Totally blind	6-10	SS, Economics, EVS	1,2,3,4,5,6,7,8,9,10
P9	Pvt.	F	Low vision	>15	Science, Braille, Kannada, English, Music	1,2,3,4,5,6,7,8,9,10
P10	Pvt.	F	Low vision	11-15	English, Math, Economics	1,2,3,4,5,6,7,8,9,10,11,12
P11	Pvt.	F	Totally blind	>15	English, Hindi	8,9,10
P12	Govt.	M	Totally blind	>15	English, Science, Math, SS	4,5,6,7,8
P13	Govt.	M	Low vision	6-10	Kannada, Science	5,7
P14	Pvt.	M	Low vision	11-15	SS	8,9,10
P15	Govt.	F	Totally blind	11-15	English, Computer	1,2,3,4,5,6,7,8,9,10

Table 2: Demographic details of the survey participants from major states ($n = 105$)

State	Karnataka: 35	Odisha: 24	Telangana: 11	Tamil Nadu: 15
Gender	M: 21, F: 13, Others: 1	M: 18, F: 6, Others: 0	M: 8, F: 3, Others: 0	M: 8, F: 7, Others: 0
Experience	<5 yrs: 0, 5-10 yrs: 13, 10-15 yrs: 6, >15 yrs: 5	<5 yrs: 7, 5-10 yrs: 5, 10-15 yrs: 2, >15 yrs: 10	<5 yrs: 4, 5-10 yrs: 3, 10-15 yrs: 2, >15 yrs: 2	<5 yrs: 2, 5-10 yrs: 3, 10-15 yrs: 2, >15 yrs: 8
Use ChatGPT	Yes: 6, No: 29	Yes: 2, No: 22	Yes: 2, No: 9	Yes: 3, No: 12
Use BeMyEyes	Yes: 12, No: 23	Yes: 1, No: 23	Yes: 4, No: 7	Yes: 1, No: 14

(We received 1 response per state for Arunachal Pradesh, Bihar, Gujarat, Himachal Pradesh, Madhya Pradesh, Meghalaya, Rajasthan, Tripura, Uttarakhand, Delhi, 3 from Maharashtra, West Bengal, and 4 from Kerala.)

4.1 Current Role of Technology in Teaching:

This section explores how technology is currently employed across three key teaching stages: Preparation, Teaching, and Revision, shedding light on both its affordances and limitations within these practices.

4.1.1 Technology in Preparation: This section explores how accessibility gaps, resource constraints, and institutional norms shape TVIs' lesson preparation practices. TVIs face significant challenges in lesson preparation, including delayed Braille textbooks, lack of supplementary materials, and manual processes. To bridge these gaps, they rely on mainstream technologies, though accessibility barriers and institutional constraints often limit their effectiveness.

Lack of Accessible Textbooks and Teaching Materials: Braille textbooks often arrive late in the academic year, leaving teachers with limited time to prepare lessons and forcing them to rely on their own knowledge or seek external resources. Unlike sighted teachers in mainstream schools [26], TVIs do not receive additional reference materials to supplement their lessons.

> "Last year, I taught 1st-7th students Science. There was a problem with books...we did not get the books on time so I could cover only 25% which was basic concepts and out of my knowledge." – P6

In response, teachers turn to technology as an alternative. In P5's words, *"...because the Braille books are not provided at the right time I make use of YouTube for teaching."* YouTube and Google are frequently used to access educational content, particularly for subjects that require visual explanations. These platforms help TVIs understand concepts they need to teach, especially in subjects requiring visual explanations. However, these resources are often designed without keeping accessibility in mind, requiring TVIs to spend additional time making them usable for CVIs.

> "Now what happens is that when it comes to a sighted child, I can open YouTube and play a video about, for example, a war. Then I will explain, saying this is how the guns used to be, a saw used to be. But for our children, especially visually impaired, if we explain content like that, they will not be able to understand the concepts. So what we have to do is make

> it accessible. They need to touch and feel to learn." – P14

Another teacher (P15) mentioned how the government-provided material for teachers is not directly useful for a CVIs, *"I just listen to the things, but I prepare according to our children's requirement, right? Because Diksha (government e-learning platform) [27] and all, they keep the normal students in their mind. Here, I have to keep students with visual impairment in my mind. So, according to their requirement, I prepare my lessons."* This demonstrates how technology, while offering information access, does not replace the need for hands-on adaptation, significantly increasing teachers' workload.

Manual Lesson Planning: TVIs create their lesson plans by writing them by hand, using a Braille slate and stylus, for multiple subjects and grades due to lack of access to a Brailler and lack of technology training. P1 shared, *"I have to write every day. Braille is hard. Braillers are too expensive—45,000INR (550 USD). You have to maintain separate papers. It is costly."* From the 15 teachers we interviewed, only one teacher had access to a Brailler. Although Braillers could streamline note taking, they are largely unavailable due to high costs and maintenance issues. P11 mentioned, *"In the school also there is a brailler but it is not in a usable state. It is rusted."* Additionally, TVIs are often required to teach subjects they are not specialized in, due to a shortage of trained teachers. This necessitates extra preparation time, as teachers must first learn the material themselves before teaching it. To cope, they turn to digital resources for self-learning.

> "...I used it (YouTube) to teach English as there was no teacher to teach it. I first listen to it on YouTube and then I go and teach." – P10

This additional effort, compounded by delayed textbook availability and lack of adapted digital tools, significantly increases teachers' workload. Thus, even with digital aids, lesson preparation remains a labor-intensive and fragmented process for TVIs, reinforcing systemic workload burdens.

Preparing Notes for Students: Beyond lesson planning, TVIs are responsible for preparing Braille notes for students, a process that is also largely manual. Since students may misplace or struggle to manage large volumes of Braille text, TVIs prefer to provide notes in incremental portions. P1 shared,

> "I ask them to take notes every day, right? They never stay with the kids. They are not old enough to keep those safe. There are no ways to keep them safe. What I do is I write separate notes for students. For every subject. I make a copy, I give them one chapter at a time during revision time."

Additionally, Braille documents degrade over time, forcing teachers to constantly rewrite notes.

> "Here I write in Braille. I write some notes of lessons. But next year, the dots are gone. For sighted, there is no such problem—just keep a notebook. For me, I have to keep papers, large size; they have to be carried and stored." – P1

While digital note-taking tools could alleviate this burden, their use in classrooms is restricted. Teachers report that using technology in front of students is perceived as a lack of teaching effort, limiting the feasibility of integrating mobile devices or laptops for note retrieval during lessons. P11 shared, *"If we play anything on YouTube in the class, then it is interpreted as that we aren't teaching in the classroom. They think we are just following YouTube instead of teaching by ourselves."* Even if teachers digitized their notes, these materials could not be accessed in class due to institutional restrictions on technology use. These challenges spill over into classroom instruction, where institutional norms further restrict technology use, compelling teachers to navigate complex trade-offs between manual effort and limited digital integration.

4.1.2 Technology in Classroom Interaction: This subsection examines how TVIs incorporate technology into classroom instruction, focusing on the strategies they use, the challenges they face, and the contextual factors that shape their practices.

Dependence on Sighted Assistance for Certain Subjects: Subjects requiring visual explanations, such as Science and EVS, pose additional challenges for TVIs. Without tactile diagrams or accessible representations, teachers often rely on sighted colleagues to explain diagrams and experiments.

> "For EVS, we have to talk to sighted teachers a lot as there are a lot of experiments that are better to clarify with a sighted teacher than a visually impaired teacher." – P3

This dependency on sighted teachers introduces coordination challenges and creates inequities in classroom autonomy for TVIs. Without access to interactive learning tools or accessible visual aids, CVIs may struggle with abstract concepts, further widening learning gaps.

Use of Technology to Aid In-Class Teaching: Despite institutional restrictions, TVIs creatively leverage digital tools to enhance classroom instruction. Teachers selectively incorporate platforms like YouTube directly into their classes to provide students with clear examples and enhance engagement. For instance, P7 shared, *I use YouTube in the class. I select the YouTube channel that has language fluency.* Technology also assists TVIs in introducing unfamiliar objects or concepts. For example, while introducing students to a new chapter based on a Sitar maestro, P11 used YouTube to provide authentic and reliable audio demonstrations of the instrument.

> "I will search it on YouTube saying "sitar music" and then I will get it. In YouTube it will be genuine they won't put false instruments."

This highlights the importance of using trusted sources to provide students with accurate and engaging content. Additionally, one of the teachers (P15) also experimented with voice-assisted technology such as Alexa (Amazon's voice assistant) to make learning more interactive, particularly for quizzes and general knowledge. She describes her experience,

> "First switch on Alexa. There are some games. If I say 'Alexa start a quiz of India', Alexa will ask questions: how many players. Students will say we are 4 or 5.

> Alexa will take names of the students. First thing is for (Student 1), second for (Student 2). When Alexa asks, the student answers. Alexa will play some music if the answer is correct. The students will also enjoy."

While these tools engage students and facilitate active learning, they remain informal and teacher-driven rather than institutionally supported. Nevertheless, despite these efforts, institutional skepticism and lack of structured technology integration hinder widespread adoption. Teachers must self-navigate digital tools, often without training or institutional support, making sustained usage difficult. While some teachers experiment with digital tools, their usage remains sporadic and highly dependent on institutional approval and individual initiative. Additionally, reliance on sighted teachers and restrictions on in-class technology create significant barriers to equitable teaching experiences. The next subsection explores how technology is used in revision and exam preparation, a stage where TVIs face additional workload challenges due to limited digital access, memorization-based learning, and reliance on oral repetition.

4.1.3 Technology in Revision and Exam Preparation: Revision and exam preparation pose unique challenges for TVIs due to limited availability of structured revision resources and accessible materials. Teachers predominantly rely on traditional memorization techniques and oral repetition, supplemented by sporadic technology use outside of class.

Memorization-Based Learning and Oral Repetition: Given the lack of accessible digital revision materials or structured Braille content, TVIs primarily depend on oral dictation and repetition-based learning. Teachers contrasted these practices with the more self-directed, resource-rich revision approaches available to sighted students.

> "Sighted students will take notes and highlight important parts in the textbook, but for VI students, we explain everything in detail... We will check last year papers and then prepare them for that. We conduct tests after every lesson and if they don't perform well, we make them write those answers 5 times." – P6

This method ensures reinforcement of information, but it also increases teacher workload, as they must repeat the same content multiple times for different student groups. Some teachers attempt to compensate for exam-related challenges by reinforcing oral revisions and dictation-heavy study techniques. However, these methods place additional strain on teachers, who must conduct frequent revisions and ensure students memorize key concepts verbatim. Moreover, as noted in Section 4.1.1, students rarely possess individual revision materials, forcing TVIs to rely solely on verbal scaffolding, an approach that is time-consuming and lacks personalization.

Use of Technology for Revision and Practice: Despite institutional limitations, some teachers creatively integrate digital tools into the revision process. YouTube is a commonly used platform during the exam preparation phase, particularly to identify expected questions or reinforce challenging topics.

> "...yeah that too while examination time (shows them youtube videos), not always. When they have to face it at that time. Because there will be most expected questions, important questions like that" – P11

This illustrates how TVIs selectively employ technology during high-stakes scenarios, driven by urgency rather than structured integration. Others adapt online content to simulate real exams and enhance student confidence.

> "We complete all the portions and also do revision for 15 days. Then we also prepare one or two model question papers. We make them write and then evaluate their papers, and then we tell them what mistakes they need to correct. That's how we help them prepare for exams." – P7

Such efforts often mimic formal exam environments but are undertaken independently, without institutional tools or training. The burden of exam preparation extends beyond content revision. As P6 reflected, *"Exam is not just a challenge for the student but also for the teachers. We have to prepare question papers. Rather than calling this a challenge, creating question papers is a big task."* Taken together, these practices reflect a fragmented but persistent effort to use technology as a revision aid. However, such initiatives remain isolated. Teachers lack formal training, consistent access, or platform guidance, making technology use uneven and heavily dependent on individual initiative.

Exam Processes and Challenges for TVIs: While some digital tools are used in exam preparation, the examination process itself remains entirely analog. Exams in schools for the blind rely on Braille-based responses or scribe assistance, with no institutional integration of assistive technologies. Students typically complete exams in Braille up to 9th grade but must transition to using scribes for public board exams due to examination regulations.

> "Children write other subjects in Braille. We tell them the questions, and they write answers in Braille. Then we collect all those papers and evaluate. Now since there is board exam for 8th and 10th-grade students they should have scribe writers. Braille is not allowed for the board exams. In our school, teachers find writers to write exams. So we get approval from DDPI (Deputy Director of Public Instruction) with written letter and write the exam." – P9

This process illustrates both the procedural complexity and the reliance on informal systems to accommodate basic exam logistics. Teachers must navigate approvals and manage the logistics of pairing students with scribes, adding responsibility to their already overburdened shoulders. Teachers must identify and train suitable scribes, ensuring they can accurately transcribe dictated responses within the allotted exam time.

> "The scribe should not be more than one year younger than the student. But sometimes we don't get scribes, and then there are issues." – P6

The scribe eligibility criteria further complicate the process, often resulting in delays or a shortage of available scribes, which adds last-minute pressure for both teachers and students. Moreover, as noted in the prior study, students often struggle with dictating structured responses under exam pressure, as they do not have the ability to edit or visually verify their answers [11, 30, 49]. This format also raises concerns about fairness, as the quality of responses may depend on the scribe's ability to write quickly and accurately.

While digital tools and assistive technology could potentially improve accessibility in assessment formats, their use remains limited due to institutional restrictions and a lack of familiarity among both teachers and students. As a result, despite isolated efforts, TVIs remain dependent on labor-intensive methods, underscoring the urgent need for systemic reforms to enable equitable technology integration in assessments.

These findings highlight the uneven integration of technology across different teaching stages. While some teachers experiment with digital resources, systemic barriers such as institutional restrictions, lack of training, and inaccessible tools prevent meaningful adoption. This presents a major challenge for the potential implementation of GenAI tools in TVI education. These challenges stem from deeper systemic barriers in schools for the blind. The next section examines how institutional policies, infrastructure gaps, and administrative constraints shape the adoption of technology in TVI education.

4.2 Systemic Challenges in the Schools for the Blind

Despite the potential of technology to support teaching and learning, schools for the blind face deeply embedded systemic barriers that limit its meaningful integration. These challenges stem from teacher workload, lack of resources, and administrative constraints, forcing TVIs to work within an under-supported educational framework. Several of these challenges have already been discussed in Section 4.1, particularly the delayed access to Braille textbooks, absence of supplementary teaching materials, manual lesson planning, and restrictions on technology use. These systemic issues not only affect lesson delivery but also shape broader concerns around teacher workload, subject expertise, and student learning progression.

4.2.1 Institutional Restrictions on Technology Use: Institutional norms and administrative controls limit TVIs' autonomy to integrate technology in classrooms, reinforcing stigma and procedural barriers. TVIs report strict regulations on mobile phone usage, making it difficult to incorporate digital tools into their teaching practices. Many teachers express hesitation about using technology in class, as it is perceived as a lack of effort rather than an instructional aid.

> "If we play anything on YouTube in the class, then it is interpreted as that we aren't teaching in the classroom. They think we are just following YouTube instead of teaching by ourselves. It is quite insulting." – P11

While some teachers seek special permission to use YouTube for storytelling and subject explanations, this process is cumbersome and reinforces the stigma around technology use in schools for the blind.

> "I took permission because I wanted to show it to children. There are some very good YouTube channels to make them listen to stories. I wanted to make them listen to Merchant of Venice at any cost on YouTube. Those stories are very good. Children feel happy." – P11

This highlights a fundamental institutional barrier—while technology could enhance learning, its use is often discouraged or misunderstood.

4.2.2 Multi-Grade Teaching Burden: Unlike mainstream schools where teachers typically specialize in a single subject or grade, teachers in schools for the blind frequently teach multiple subjects across multiple grades simultaneously. This multi-grade arrangement significantly complicates lesson planning and classroom management, as TVIs must concurrently address diverse learning needs within the same instructional session. In our sample, all 15 TVIs reported teaching multiple grades (Table 1), with the number of grades per teacher ranging from 2 to 12 (M = 6.5, SD = 2.9). Over half of the teachers (n = 9) were responsible for six or more grade levels, underscoring the substantial cognitive and administrative workload involved.

> "In our school, we have combined classes. 1st-3rd has one classroom, 4th-5th has one classroom, and 6th and 7th share one classroom. 8th, 9th, and 10th have individual classrooms. If I teach the 4th grade today, I will teach the 5th grade tomorrow." – P6

Since students in combined classrooms learn at different paces, some struggle to keep up, while others receive less individualized attention. Teachers expressed concerns that students who fall behind may not receive the remedial support they need due to time constraints and a lack of additional teaching staff.

> "I teach from class 1 to 3, and there are only five students in total. But the problem is, they are all at different levels. Some of them have only just started learning Braille, while others have been here since 1st grade." – P5

To mitigate this, teachers seek assistance from students themselves, creating a peer-learning structure where advanced students help lower-grade students understand concepts. As P1 mentioned, *"I make a group of 1-2 students. I give a lesson to each group to go and learn. Then I exchange notes from one group to another group."* This adaptive approach compensates for limited teaching staff but also reinforces the need for more structured technological interventions to support differentiated instruction. This challenge is exacerbated when students join later grades without foundational knowledge, as is often the case when children are transferred from mainstream schools to schools for the blind at a later stage [53]. In such cases, TVIs must simultaneously teach basic literacy skills alongside the standard curriculum, further stretching their teaching capacity.

> "In blind schools, some students may come in 4th or 5th standard after studying in normal schools, but they don't know Braille yet. So we have to teach them Braille first before they can start learning their lessons." – P15

This dual burden of teaching grade-specific content while also introducing foundational skills further limits instructional time, reinforcing systemic barriers to equitable education.

4.2.3 Teachers Teaching Outside Their Expertise: While the previous subsection highlighted how TVIs navigate multi-grade classrooms, another persistent challenge lies in teaching subjects outside their formal training. While Section 4.1 highlighted how TVIs rely on online content and peer support to compensate for subject expertise gaps, we now examine the deeper implications of this issue. The shortage of specialized subject teachers often requires TVIs to teach subjects outside their formal training, significantly increasing their preparation burden and affecting the depth of instruction they can offer. In our sample of 15 teachers, 9 reported teaching three or more subjects (Table 1), ranging from Mathematics and English to Braille, Science, and Computer Literacy. However, many of them had formal expertise in only one or two subjects. This mismatch between subject assignments and teacher training is a structural issue across schools for the blind, where generalist teaching roles are the norm due to a lack of trained staff.

One key issue is that teachers rely heavily on text-based materials, which are insufficient for STEM education, particularly for subjects like mathematics and science, which require diagrams, equations, and hands-on experiments. Without training in tactile graphics or accessible STEM tools, TVIs struggle to effectively convey these concepts.

> "For mathematics, I do not have the teaching aids that sighted schools have. If a student asks me to explain a graph, I cannot show them because there is no tactile diagram available. I have to describe everything orally, which is very difficult." – P3

Another challenge is the impact on teachers' confidence and autonomy when they are required to teach subjects they have not specialized in. TVIs reported feeling less equipped to teach certain subjects, leading them to depend on external sources for guidance. This affects their ability to independently develop teaching strategies and increases their reliance on sighted colleagues.

> "I don't teach anything unless I know it. Once, they assigned me to teach Hindi, but it is not my subject. I studied Hindi in school, but I am not an expert in it. I sought help from sighted school teachers first and then asked help from children who scored well. Only then did I feel confident teaching it." – P11

This lack of teacher autonomy means that rather than developing their own subject expertise, TVIs often have to defer to others, which slows down lesson planning and reduces opportunities for self-driven professional growth. Moreover, even when TVIs attempt to learn new material through digital resources, they encounter accessibility barriers, making it difficult to grasp concepts independently.

> "I use Google a lot, but the problem is that I cannot always understand the diagrams and charts that come with the information. Sometimes, I ask a sighted teacher to explain it to me before I teach it in class." – P10

While technology provides some level of support, the lack of accessible, subject-specific training and resources for TVIs reinforces dependency on external sources, limiting both instructional flexibility and long-term capacity building.

4.2.4 Lack of Classroom Technology and Assistive Tools: Despite the growing availability of mainstream digital tools, many schools for the blind continue to lack the necessary infrastructure to support assistive technology in meaningful ways. TVIs frequently reported that essential tools such as braillers, screen readers, or even functioning smartphones were either not available or not maintained, limiting their ability to incorporate digital resources into their teaching practices. P11 shared, *"In the school also, there is a brailler, but it is not in a usable state. It is rusted."* For many teachers, the absence of reliable assistive devices means that basic tasks such as lesson planning, note preparation, and content delivery must be done manually, often with significant physical effort. While a brailler can significantly ease the workload of preparing materials in Braille, its cost and maintenance needs render it inaccessible to most. In some cases, only a single outdated device was available for the entire school, and even that remained unused due to disrepair.

Additionally, the introduction of newer technologies, such as smartphones or AI-based tools, is hindered by limited digital literacy and lack of formal training. Even when devices are distributed through NGO programs or government schemes, teachers often receive little to no orientation on how to integrate these tools into their workflows. As a result, adoption remains inconsistent and mostly self-driven.

> "I have never used a smartphone all these years. I received the smartphone 5/6 months ago. I have learned many things after I got the phone, and I am happy." – P9

This quote highlights both the potential and the problem: while some TVIs are eager to adopt new tools, they are left to figure out these systems on their own, often without support from the institution. In schools where mobile phone use is restricted in the classroom, even teachers who do become comfortable with devices cannot apply their knowledge in teaching contexts. Furthermore, applications that could facilitate reading, tactile exploration, or STEM learning are often inaccessible or not available in local languages, further constraining their usefulness.

Taken together, these infrastructural and training gaps create a significant barrier to the integration of assistive technologies, reinforcing dependence on traditional, manual methods and limiting innovation in classroom practices.

4.3 The Institutional and Social Landscape

Beyond school-level challenges, broader institutional policies and societal attitudes shape how technology is integrated into education for CVIs. This section explores key structural issues such as government policies, NGO interventions, and the ongoing debate between Braille literacy and technology reliance.

4.3.1 Right to Education (RTE) and Automatic Student Promotion: RTE Act [21] mandates automatic promotion of students to the next grade, irrespective of their academic performance or subject comprehension. While this policy is well intentioned and meant to reduce dropouts and promote inclusivity, it often leads to students progressing without adequate reading, writing, or Braille literacy, particularly in schools for the blind.

> "One main problem is that under the SSA (Sarva Shiksha Abhiyan)[1] program, they give admission to all children with disabilities. But for severely impaired children, 60-70% don't get good education. They don't learn to read or write properly because they are promoted without foundational knowledge." – P1

Teachers reported that they frequently encounter students in middle or higher grades who have not mastered basic skills, especially when children transfer into schools for the blind after spending early years in mainstream settings. In such cases, TVIs are forced to divide instructional time between teaching grade-level content and reteaching foundational concepts like Braille literacy or numeracy. Moreover, TVIs often shoulder the additional responsibility of raising awareness and actively recruiting students to schools for the blind, particularly in rural or underserved areas. P6 stated, *"Every year, we do a survey to admit students to our school. Teachers and staff go door to door finding VI kids and try to enroll them."* Teachers view these outreach activities not merely as administrative tasks, but as crucial steps to providing educational opportunities, especially for marginalized students. P1 highlighted this broader social commitment, emphasizing the importance of education for girls who face compounded exclusion due to gender and disability.

> "I didn't want to go to other professions. I wanted to immerse myself in teaching. With the intention of girl students. Parents don't send them out. After a certain age, they don't get livelihoods. When I was 21 years, my age group women didn't get any opportunity. So I decided to immerse myself in primary education. I have to go to grassroots, do surveys. So I have to give opportunity to other girl children... I want to bring the girl students to mainstream. I know the pain of girl students." – P1

This dual responsibility of reteaching foundational skills while also actively promoting enrollment significantly increases the teacher workload and affects classroom pacing, as it becomes difficult to implement a consistent or advanced curriculum. Consequently, systemic issues within the RTE policy framework, combined with broader societal barriers, reinforce existing inequities, challenging TVIs' ability to deliver comprehensive and effective education.

4.3.2 Delays in Government-Provided Braille Textbooks: A persistent challenge in schools for the blind is the late delivery of Braille textbooks, which forces teachers to either create their own materials or delay lesson plans.

> "We did not get the books on time, so I could cover only 25% of the syllabus using basic concepts and my own knowledge." – P6

NGOs sometimes step in to fill this gap, but there is no standardized or timely system for providing alternative materials. This delays learning and places additional pressure on teachers to source content from external resources like YouTube and Google.

4.3.3 NGO Interventions in Bridging Educational Gaps: In the absence of comprehensive governmental support, several NGOs have emerged as critical actors in improving the educational experiences of CVIs and their teachers. Organizations like VE and Winvinaya Foundation have initiated targeted programs that aim to address systemic inequities in teaching resources, training, and technology access in schools for the blind. These initiatives span teacher training in accessible pedagogy, distribution of assistive smartphones, development of tactile STEM materials, and the introduction of inclusive curricula such as computational thinking [17, 38, 39].

Teachers described these interventions as transformative both for their teaching practice and for student engagement. One teacher (P9) highlighted the tangible improvements following VE's introduction of STEM TLMs *"It's been two years since Vision Empower started their program in our school. They have sent a lot of science and math teaching material to us. We are also using those teaching aids."* Beyond resource access, these programs appear to build teacher confidence and promote enthusiasm in subject areas that were previously seen as inaccessible. As one teacher described:

> "Since Vision Empower's intervention has started in our school, I am getting more interested in this (Maths) subject. The games and activities are interesting. Even I have studied Math till 7th grade. After we started receiving the activities from Vision Empower, the children are excited, and I am also enjoying. We teach math through games." – P4

This pedagogical shift was also observed in science education, where conceptual teaching was historically difficult due to a lack of visual aids. After attending a VE training, P3 reported:

> "Initially I found EVS difficult since most of its portion is visual, like experiments. After attending VE's training in Bangalore, I found it quite easy. Earlier we didn't know how to explain lungs. So we understood how to explain lungs in the training."

The impact of these interventions extended beyond content knowledge to the cultivation of a learning community among teachers. P2 reported, *"...Vision Empower (taught how to use tech). There is a teachers group. There I learnt a lot."* Importantly, NGOs have also supported first-time access to smartphones and digital tools for many teachers. This digital onboarding has opened up new avenues for communication, information access, and pedagogical experimentation.

> "It's been 6 months since Vision Empower has provided mobile phones through Winvinaya Foundation. All these years I had only a keypad phone. I didn't know the new technology. After I got mobile phones I learnt 50–60%. I learnt how to open and search on YouTube and how to send a WhatsApp voice message. It is so easy with talkback and this is so helpful to me." – P9

A particularly innovative example was the use of tactile math games to teach abstract concepts through play.

> "There are some materials to teach math. The objective of VE is to make Math and Science concepts accessible. Those materials are beneficial to our students to get knowledge. For instance... they have sent accessible snake and ladder board on which blind students learn.

[1] SSA is a government program that operationalizes the RTE Act, focusing on universal elementary education, including enrollment and support for children with disabilities.

> They also learn counting. These materials are very helpful. It could be for fraction or for ratio... It helps us teach ratio and proportion." – P10

Despite their transformative potential, these programs are not yet universally accessible. NGO-led initiatives are often limited to specific schools and constrained by funding, geographic coverage, and personnel availability. As a result, the scale of impact remains fragmented. In schools not included in these programs, TVIs continue to struggle with insufficient access to teaching resources, inadequate training, and lack of exposure to emerging technologies.

Furthermore, while NGO interventions lay the foundation for inclusive educational practices, they cannot substitute for systemic integration. The success of these initiatives highlights the need for state and national education systems to institutionalize such efforts embedding accessible pedagogy, assistive technology provisioning, and teacher training into the broader curriculum and policy landscape. NGO interventions have proven effective in catalyzing change at the local level. However, sustaining and scaling these practices will require long-term investment, broader policy integration, and active collaboration between government institutions, civil society organizations, and teachers themselves.

4.3.4 Braille Literacy vs. Technology Reliance: One of the most debated and emotionally charged issues in education for the blind is the balance between maintaining Braille literacy and adopting new technologies. While many teachers appreciate the potential of digital tools, they remain deeply committed to Braille as a foundational skill for CVIs. This tension reflects broader concerns around long-term literacy, cultural identity, and educational equity. Several teachers expressed strong concerns that technology, if adopted uncritically, might erode Braille proficiency. For them, Braille is not merely a medium of instruction but a symbol of independence and depth of understanding.

> "Even if there is technology, we should not forget Braille. There is a difference between home food and hotel food. According to me, home food is Braille script, and hotel food is technology." – P3

Others fear that over-reliance on voice-based tools, screen readers, or AI-generated responses may encourage surface-level comprehension, as students may listen passively rather than engage with the text through tactile reading and writing. They see Braille as critical for reinforcing spelling, grammar, and long-term memory.

At the same time, several teachers acknowledge that technology can enhance teaching and learning, especially when adapted well to the needs of CVIs. However, they caution against full dependence on it. P15 explained their careful integration of technology into teaching, highlighting the importance of ensuring students do not abandon Braille in favor of convenience. *"I take knowledge from YouTube and then directly teach the students, because if they know everything can be found online, they may not learn Braille at all."* Others framed technology as a necessary and powerful support system, particularly for accessing content and preparing for lessons. While not a replacement for Braille, they emphasized that digital tools can fill critical gaps in the current education system.

> "Yes, technology is good. But like how if nectar is consumed in a high amount it turns into poison... We need technology in this modern world. We cannot do anything without technology. But it has to be used only when necessary." – P3

This spectrum of views highlights the complex relationship between Braille and technology: neither is seen as inherently superior, but both are viewed as essential when used in balance. Teachers advocate for a blended approach, where Braille remains central but is augmented by accessible technologies that expand learning opportunities, especially in resource constrained environments.

Ultimately, these debates signal a critical need for policy and curriculum design that does not force a binary between Braille and technology but fosters thoughtful integration of both. Teacher training and curricular frameworks must help TVIs build confidence in using technology without compromising on Braille literacy.

4.4 Teachers' Perspective and Passion Towards Technology

Teachers' perspectives toward technology in schools for the blind are shaped by a range of factors including personal motivation, prior exposure, support systems, and confidence in using digital tools. While some teachers demonstrate an intrinsic curiosity and commitment to exploring digital aids, others remain hesitant due to perceived complexity, lack of relevance, or insufficient training. These varying attitudes significantly influence how and whether technology is integrated into classroom practices.

4.4.1 Commitment and Curiosity: Some teachers exhibit proactive attitudes toward technology and strive to integrate it into their teaching workflow. For instance, P3 shared, *"I use Google and YouTube a lot. I also use reading mode."* This suggests more than casual usage, it reflects strategic use of digital tools tailored to accessibility needs. The mention of "reading mode" indicates an awareness of interface simplification techniques, showing that the teacher not only accesses content but also optimizes it for their use.

P7 emphasized the value of built-in accessibility features, *"But with the Google TalkBack, if there is English content, we can access it easily."* This statement points to two important aspects: familiarity with screen readers and comfort with English-language resources. While this reflects progress, it also reveals a language barrier, as many educational materials are not available in regional languages.

Another teacher, P8, highlighted their independent learning efforts. They said, *"In case there is a new app or new feature on YouTube, I try to learn it myself."* This statement indicates not only a proactive mindset but also digital self-efficacy. P8 is willing to explore emerging technologies without external prompts, suggesting that curiosity alone can drive meaningful engagement if barriers are manageable. P13 reflected a growing comfort with AI-powered tools:

> "I installed ChatGPT. I used it to clear my doubts. I use Google more than ChatGPT."

The experimentation with ChatGPT shows interest in leveraging GenAI, even if the teacher ultimately defaults to more familiar tools like Google. This also implies that usability and immediate value influence sustained use. Another teacher (P15) shared, *"Yes, I watch technology-related videos. When something new comes, I explore it."* This reveals a pattern of self-directed learning and openness to innovation. Rather than waiting for formal training, P15 takes initiative, which could be amplified through structured support.

4.4.2 Disinterest and Reluctance: On the other end of the spectrum, some teachers showed limited interest in adopting technology, citing personal disinterest or a lack of perceived relevance. P11 clearly stated, *"No, I haven't used it. I am not interested. I feel mobile is not required. I use phone only when needed."* This viewpoint reflects a deeper skepticism about the role of digital tools in the classroom, possibly shaped by limited exposure or negative assumptions about their utility. It also suggests that without a compelling use case, adoption is unlikely. Even among those who initially showed curiosity, frustrations with usability sometimes led to abandonment. P7 noted, *"I used it (Be My Eyes) 2-3 times. I was finding it difficult and I uninstalled it."* This points to a gap in training and onboarding, where a lack of support and accessibility challenges lead to early disengagement. Without institutional mechanisms to address these issues, such attempts remain isolated and unsustainable. These contrasting experiences illustrate that technology adoption is not a uniform process, but a deeply contextual one. While some TVIs exhibit remarkable resilience and creativity in embracing technology, others remain hesitant or disengaged. For GenAI and other digital tools to succeed in this context, it is essential to design training and onboarding strategies that address teachers' varied motivations, build digital confidence, and demonstrate tangible value in their day-to-day teaching activities.

4.5 Current Awareness of Generative AI

To assess the familiarity and openness of TVIs to emerging technologies, we introduced two GenAI tools: ChatGPT and Be My Eyes towards the end of our interviews. Teachers were later followed up with to understand their willingness to experiment with these tools and their initial impressions. The responses revealed a mixed awareness, limited usability, and several accessibility challenges associated with these technologies.

4.5.1 Initial Engagement with ChatGPT:. A few teachers attempted to use ChatGPT following the interviews, but accessibility barriers, particularly during login and navigation often led to frustration and abandonment. For instance, P7 used it 2–3 times but eventually uninstalled it, stating *"I was finding it difficult and I uninstalled it."* P1 and P6 both reported facing difficulties with login, with P1 saying: *"I tried everything, I am not able to continue."* Similarly, P10 tried using ChatGPT for lesson planning but found it challenging due to screen reader incompatibility. They said, *"I tried using it to prepare lesson plans but I am not able to use it properly and it is not reading out the text."* However, P10 also expressed enthusiasm for ChatGPT's potential in supporting subject learning:

> "Yes, that means it is good. There is no English teacher in our school. I am asked to teach English. Now I can learn English with this tool (ChatGPT)."

This highlights how GenAI could serve dual roles for TVIs, not only aiding teaching preparation but also facilitating self-learning when teachers are asked to instruct beyond their areas of expertise. A few others like P2 and P14 cited being too busy or not having a strong enough use case to prioritize learning the application. Meanwhile, P13 offered a contrasting experience,

> "Yes, I installed ChatGPT. I used it to clear my doubts. I use Google more than ChatGPT."

This reflects that while there is curiosity and experimentation among a few, usability issues and lack of local-language support continue to be major barriers to sustained engagement with GenAI tools.

4.5.2 Awareness and Use of Be My AI:. While our primary intention was to understand TVIs' responses to Be My AI, field realities required us to adjust our approach. We had assumed some familiarity with Be My Eyes, as VE had previously introduced it in a few schools. However, during interviews, we found that most participants had either never used the app or were only vaguely aware of it. To ensure a shared baseline, we began our demonstrations with Be My Eyes before introducing its GenAI-powered extension, Be My AI. This scaffolded approach helped ground the discussion and enabled participants to better imagine the potential of emerging GenAI tools.

Be My Eyes is an application offering real-time visual support through volunteer calls. Although it was known to a few participants, active and regular use was limited. P1 and P10 described integrating the app into their daily lives, using it to read labels, documents, and identify objects. P1 said, *"On WhatsApp, if I get a message that is not accessible (images), I click on share/open with Be My Eyes and I get the description."* P3 highlighted using it for navigation and shopping-related support, and P2 described using it to match bangles and identify colors. However, P2 also shared a limitation that impacted their continued use.

> "I use it mainly for colours. Because in Be My Eyes there are very less female volunteers. Suppose we ask any personal help, we need girls. Sometimes this is a very big problem, so now-a-days I am not using Be My Eyes."

This points to an important gender and privacy consideration in app design for users with visual impairments, especially when requesting personal or sensitive support. P2 also noted challenges in connecting with Kannada-speaking volunteers, emphasizing the need for regional language support. Notably, with the exception of one participant, none of the TVIs were familiar with Be My AI prior to our demonstration. This suggests that even well-publicized GenAI-powered accessibility tools have not yet meaningfully reached this community, pointing to a critical gap between tool development and on-ground adoption in low-resource settings.

4.5.3 Language and Accessibility Concerns: Across both tools, one recurring theme was the preference for local language support. Teachers like P10 and P8 expressed that while they were comfortable with English to some extent, Kannada integration would make these tools far more usable.

> "It would be nice if it's in Kannada as it's our mother tongue." – P10

Accessibility barriers, especially during onboarding or login, also significantly impacted adoption. Several teachers (e.g. P6, P1, P9) struggled with these early steps, indicating that more user-friendly interfaces and guided tutorials are essential for effective uptake. Overall, these early interactions show that while some TVIs are open to experimenting with GenAI tools, current barriers in accessibility, language, onboarding, and relevance of use cases limit their adoption. Be My Eyes saw slightly better traction due to its immediate utility in daily tasks, but broader and more consistent usage of tools like ChatGPT will require tailored training, improved accessibility, and integration into TVIs' workflows. These findings reinforce the need for inclusive design and localized deployment strategies for any AI-based interventions targeting TVIs. Ultimately, the effectiveness of GenAI interventions will depend not only on tool accessibility but also on their ability to meaningfully integrate into the everyday workflows of TVIs, respecting their teaching context and priorities.

4.6 Survey Analysis

Our pan-India survey (n = 85) examined whether patterns observed in our qualitative Karnataka study were consistent across other states. We analyzed responses from Karnataka (n = 35), Odisha (n = 24), Tamil Nadu (n = 15), and Telangana (n = 11). Salary responses were collected from 55 out of 85 total respondents. Our survey findings are reported using mixed-format tables, integrating numerical data (e.g., response counts and percentages) alongside qualitative descriptors (e.g., "lower," "higher," "reported") to convey both statistical patterns and nuanced state-level variations. The following tables present state-wise comparisons across key themes emerging from our analysis.

Our analysis confirms that patterns observed in Karnataka; overwhelming workloads, infrastructure gaps, and constraints on technology adoption, appear consistently across all surveyed states. Table 3 summarises teacher workload and planning methods; Table 4 details time investment across teaching activities; Table 5 presents technology usage and perceived benefits; Table 6 outlines infrastructure availability; Table 7 explores salary, workload, and technology use correlations. Our findings indicate that while teachers recognize the benefits of technology and demonstrate adoption where possible, reported barriers across states, including infrastructure gaps and institutional support needs, continue to shape their practice. Notably, even states with relatively better infrastructure and technology adoption, such as Tamil Nadu and Telangana, continue to face gaps in accessible teaching aids and holistic institutional backing. The data shows no consistent relationship between salary levels, workload distribution, and technology adoption, indicating that structural enablers, rather than individual teacher characteristics, play a defining role. These findings underscore the urgency of addressing ecosystem-level barriers to create enabling environments for meaningful technology integration and to prepare schools for future GenAI readiness.

5 Discussion

Our findings uncover a fundamental paradox: while many TVIs express enthusiasm, curiosity, and even commitment toward using technology in their practice, systemic and institutional barriers significantly limit its adoption. Across teaching stages, from lesson planning to teaching and revision, teachers have independently turned to platforms like YouTube, Google, and voice assistants to supplement their practice. However, these efforts remain fragmented and unsustained due to prevailing school norms, limited training, and lack of accessible infrastructure. This disconnect between intent and feasibility underscores the need to look beyond individual readiness and toward structural change.

5.1 Schools as Gatekeepers: Reframing Perceptions of Technology Use

One of the most significant barriers to technology integration lies not in teacher readiness but in school culture and administrative perception. Teachers reported that using YouTube videos or mobile phones in the classroom is often viewed by school management as a lack of effort or seriousness, forcing TVIs to seek special permission for even minor technological interventions. This institutional skepticism creates a cycle where teachers - despite personal initiative, are discouraged from open experimentation or long-term integration of digital tools into their pedagogy. This finding is especially critical because it repositions the issue of "readiness" away from individual capacity to systemic design. It is not simply that teachers need more training (though many do); rather, the environments in which they work must evolve to acknowledge and support the transformative potential of accessible technologies.

5.2 The Promise of Generative AI in Bridging Gaps

Within this constrained environment, GenAI holds immense potential to become a mediator - between teachers and inaccessible digital content, between complex subject matter and the need for tactile/audio-first delivery, and between the rigid structures of schooling and the dynamic needs of CVIs. For instance, many teachers reported relying on YouTube videos to understand abstract concepts like war scenes, experiments, or poetry recitation. However, these videos are not designed with visual impairments in mind, and teachers often struggle to translate this information into accessible, meaningful formats for students. GenAI could potentially bridge this gap by converting video content into tactile-friendly descriptions, simplified audio narratives, or even scripts that TVIs can modify and deliver. This would not only make the content accessible to CVIs but also scaffold teacher understanding, especially for those teaching outside their subject expertise. Furthermore, GenAI systems could help generate lesson summaries, quizzes, model answers, or practice questions, thereby reducing the time-intensive burden of lesson preparation and revision support. These tools could be particularly helpful in multi-grade classrooms, where differentiated instruction is currently managed through peer learning and repetitive oral dictation.

5.3 Designing for Context, Not Just Access

Yet, as promising as these solutions are, their implementation must be deeply contextualized. As our study shows, tools like ChatGPT and Be My Eyes saw only partial uptake. Challenges included poor login accessibility, unfamiliar interfaces, limited language options (especially Kannada), and gendered concerns around volunteer interaction. These responses underline the importance of designing not just for access but for trust, relevance, and socio-cultural fit. For example, while a teacher appreciated ChatGPT's ability to help her learn English in the absence of an English teacher at her school,

Table 3: Comparison of teacher workload and planning methods across states (n = 85)

Category	Karnataka	Odisha	Tamil Nadu	Telangana
Workload demands				
Grade levels	Avg: 5	Up to 13	4–6	Similar
Subjects taught	Up to 6	Up to 14	3–4	2–4
Combined classes	60%	29%	Lower	Lower
Lesson planning methods				
Brailler use	32.3% (11/35)	62.5% (15/24)	40% (6/15)	Lower
Handwritten	32.3% (11/35)	8.3% (2/24)	Similar to Braillers	Lower
Digital docs	35.5% (12/35)	12.5% (3/24)	Lower	55.5% (6/11)

Table 4: Time investment across states: teachers reporting 0–2 hours daily (n = 85)

Activity	Karnataka	Odisha	Tamil Nadu	Telangana
Teaching concepts	57% (20/35)	67% (16/24)	33% (5/15)	46% (5/11)
Lesson planning	66% (23/35)	71% (17/24)	<50%	46% (5/11)
Assessment	45.7% (16/35)	Majority	Balanced	Varied
Admin work	60% (21/35)	Similar	Balanced	Varied

Table 5: Technology usage and perceived benefits across states (n = 85)

Category	Karnataka	Odisha	Tamil Nadu	Telangana
Technology usage				
For preparation	77.1% (27/35)	45.8% (11/24)	86.7% (13/15)	81.8% (9/11)
For teaching	71.4% (25/35)	45.8% (11/24)	80.0% (12/15)	81.8% (9/11)
Perceived benefits				
Knowledge	76.2% (16/21)	66.7% (8/12)	86.7% (13/15)	81.8% (9/11)
Lesson planning	47.6% (10/21)	41.7% (5/12)	60.0% (9/15)	54.5% (6/11)
Classroom	38.1% (8/21)	20.8% (3/12)	53.3% (8/15)	45.5% (5/11)

Table 6: Infrastructure availability across states (n = 85)

Resource	Karnataka	Odisha	Tamil Nadu	Telangana
Internet	26% (9/35)	17% (4/24)	40% (6/15)	55% (6/11)
Tactile aids	60% (21/35)	67% (16/24)	33.3% (5/15)	9.1% (1/11)
Hands-on kits	23% (8/35)	21% (5/24)	40% (6/15)	18.2% (2/11)
Lab facilities	3% (1/35)	Similar	Higher	Higher
Books	Not specified	Not specified	Available	63.6% (7/11)

others found the interface inaccessible or content confusing. Similarly, female teachers noted discomfort with Be My Eyes due to the lack of female volunteers, underscoring how even well-intended assistive tech may fall short without localization and user-centric adaptations.

5.4 Global North and South: Unequal Trajectories of GenAI for TVIs

While this study focuses on TVIs in the Indian context, it is important to acknowledge how GenAI is evolving differently across geographies. In the Global North, TVIs have begun experimenting with GenAI tools such as ChatGPT to support teaching-related tasks. For instance, a blog by Perkins School for the Blind highlights how TVIs are using ChatGPT to brainstorm lesson plans, simplify explanations, and structure content in more accessible formats [34]. However, formal research specifically focused on GenAI use by TVIs in the Global North remains limited.

This gap may be partially explained by the fact that, in many Global North education systems, teachers of CVIs are typically sighted educators working in inclusive classrooms. A recent systematic review confirms that most literature addressing instruction for CVIs refers to sighted teachers, with minimal attention given to

Table 7: Salary, workload, and technology use (n = 55)

Salary (INR)	% (n)	Workload	Tech usage
<10,000	14.5% (8)	Up to 11 grades, 14 subjects	62.5% both
10K–25K	43.6% (24)	Up to 11 grades, 6 subjects	58.3% prep, 50% teaching
26K–40K	9.1% (5)	Up to 11 grades, 4 subjects	20% both
41K–60K	12.7% (7)	2–9 grades, 2–7 subjects	85.7% prep, 71.4% teaching
Not disclosed	16.4% (9)	Up to 11 grades, 6 subjects	77.8% both

the experiences or needs of TVIs themselves [18]. As a result, much of the GenAI discourse and design in the Global North implicitly assumes that the educator is sighted and is using AI to support students with disabilities, rather than being a PwD navigating the system firsthand.

In contrast, in the Global South, especially in countries like India, many teachers working with CVIs are blind or low-vision themselves and often teach in segregated schools for the blind [28]. As our findings show, these TVIs encounter multiple friction points while trying to use the same GenAI tools, including inaccessible login interfaces, unfamiliar command structures, unreliable internet connectivity, and limited linguistic or cultural relevance. Even when teachers were enthusiastic, their use remained exploratory or was eventually discontinued.

These disparities reflect broader structural differences. While efforts in the Global North benefit from systemic support, resource availability, and institutional mandates for accessibility, adoption in the Global South tends to be fragmented and heavily reliant on individual initiative or NGO-led interventions [3, 37]. Furthermore, most GenAI tools today are not designed for PVIs in low-resource environments, particularly those who juggle teaching multiple grades and subjects with minimal support. This highlights a critical gap in inclusive design, a failure to consider the lived realities of TVIs themselves. These findings set the stage for rethinking not only tool design but also the broader ecosystem of support required for equitable AI integration in education.

5.5 From Individual Effort to Systemic Support

Finally, we argue that future AI interventions must move away from the narrative of teachers as isolated innovators and toward system-supported, sustainable infrastructure. TVIs should not have to shoulder the burden of discovery, adaptation, and advocacy alone. A successful integration of GenAI requires schools and educational authorities to redefine what teaching looks like in schools for the blind—not by enforcing outdated norms but by enabling inclusive, tech-supported practices grounded in teacher input and community values.

6 Limitations

Our study has several limitations. First, while the qualitative interviews were rich and reached thematic saturation, they were limited to 15 participants from Karnataka. As a result, while the findings offer depth, their generalisability to other states remains uncertain. Second, the survey responses predominantly represent teachers from four states: Karnataka, Odisha, Telangana, and Tamil Nadu. These states account for a significant proportion of the VE's network, which spans approximately 150 schools for CVIs across India. While this provides valuable insights into systemic trends across these states, the findings may not fully generalise to all schools for the blind in India, especially those outside the VE's network or in underrepresented regions. Third, our survey coverage is inherently shaped by the challenges of identifying and reaching schools for the blind in India. Despite VE's extensive network, the overall number of such schools remains relatively small and dispersed, complicating broader outreach and comprehensive representation. Fourth, the survey may have been more accessible to TVIs who were already somewhat comfortable with technology, potentially skewing the responses toward digitally engaged participants and under-representing TVIs who face higher barriers to digital access. Finally, our study does not include the perspectives of school administrators or parents of CVIs, whose insights would have provided important triangulation, particularly in validating infrastructure constraints and institutional dynamics influencing technology use.

7 Conclusion

Our study foregrounds the lived experiences of TVIs in India, an essential yet often overlooked group in conversations around inclusive education and emerging technologies. While multi-modal GenAI holds significant promise to enhance the educational experience of CVIs, our findings reveal a stark contrast between this promise and the material, infrastructural, and institutional realities in which their teachers operate. Our work contributes to an emerging agenda in HCI and AI for education that insists on equity not as an add-on, but as a foundational design principle. By positioning TVIs not merely as end-users but as co-designers of educational futures, we call for a paradigm shift in how AI tools are imagined and deployed. Without such a shift the promise of GenAI might remain just that, a promise.

Acknowledgments

We are deeply grateful to the teachers who generously shared their time, insights, and experiences with us. We thank Rajesh S. Paali, Venkatesh Deshpande, Rajeswari Pandurangan, Devidatta Ghosh, and Rishi Vadhana from Vision Empower Trust for their invaluable support with participant recruitment, coordination, and translation. We also thank Roshni Poddar, Nischith Shadagopan, Anush Kini, and Adharsh Kamath for their assistance during the interview phase of the study.

References

[1] Khan Academy. 2023. Khanmigo AI Tutor. https://www.khanmigo.ai/ Accessed April 2025.
[2] Amira Learning. [n. d.]. Amira Learning: AI Reading Assistant for Students. https://amiralearning.com/. Accessed: 2025-04-10.
[3] Payal Arora and Nimmi Rangaswamy. 2019. Digital India and the Poor: From Inclusion to Control. *Media, Culture & Society* 41, 7 (2019), 982–999. doi:10.1177/0163443718813486
[4] Be My Eyes. 2025. Be My Eyes: See the World Together. https://www.bemyeyes.com/ Accessed: 2025-04-09.
[5] Carnegie Learning. [n. d.]. Carnegie Learning: AI-Driven Personalized Learning Solutions. https://www.carnegielearning.com/. Accessed: 2025-04-10.
[6] Victoria Clarke and Virginia Braun. 2017. Thematic analysis. *The journal of positive psychology* 12, 3 (2017), 297–298.
[7] John W. Creswell and J. David Creswell. 2018. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* SAGE Publications.
[8] Department for Education. 2023. 2022-23 Technology in Schools Survey. https://assets.publishing.service.gov.uk/media/655f8b823d7741000d420114/Technology_in_schools_survey__2022_to_2023.pdf
[9] S. Dey et al. 2021. Design of Programs for Students and Teachers with Visual Impairment in the Global South: COVID-19 response in Karnataka, India. *Unpublished Report* (2021). https://cdn.disabilityinnovation.com/uploads/documents/CHI-Workshop_submission_11.pdf?v=1616667543 Vision Empower case study on training visually impaired teachers.
[10] Mrunal Sanjay Dhaygude, Naitik D. Lapsiya, and Dipanjan Chakraborty. 2022. There is no app for that: Manifestations of the digital divides during COVID-19 school closures in India. *Proceedings of the ACM on Human-Computer Interaction* 6, CSCW2 (2022), 415:1–415:26. doi:10.1145/3555140
[11] Graeme Douglas, Michael McLinden, and et al. 2011. Access to assessment for visually impaired learners. *British Educational Research Journal* 37, 5 (2011), 713–729. doi:10.1080/01411926.2010.509707
[12] DreamBox Learning. [n. d.]. DreamBox Learning: Online Math and Reading Solutions. https://www.dreambox.com/. Accessed: 2025-04-10.
[13] Duolingo Team. 2023. Introducing Duolingo Max, a Learning Experience Powered by GPT-4. https://blog.duolingo.com/duolingo-max/ Accessed: 2025-04-09.
[14] Vision Empower. 2024. *Landscape Mapping of the Visual Disability Sector in India: Stakeholder Perspectives and Recommendations for Action.* Technical Report. Vision Empower, Bangalore. https://visionempowertrust.org/arc/wp-content/uploads/Landscape-Mapping-Report_Vision-Empower_2025.pdf License: CC BY-NC-ND 4.0.
[15] Envision Technologies. 2024. Envision AI. https://www.letsenvision.com/. Accessed: April 10, 2025.
[16] Be My Eyes. 2023. Introducing: Be My AI. https://www.bemyeyes.com/blog/introducing-be-my-ai/ Accessed: 2025-04-09.
[17] Raised Lines Foundation. 2025. Raised Lines - A section 8 Non-Profit. https://raisedlines.org/. Accessed: 2025-04-16.
[18] Rana Ghoneim, Wajdi Aljedaani, Renee Bryce, Yasir Javed, and Zafar Iqbal Khan. 2024. Why Are Other Teachers More Inclusive in Online Learning Than Us? Exploring Challenges Faced by Teachers of Blind and Visually Impaired Students: A Literature Review. *Computers* 13, 10 (2024), 247. doi:10.3390/computers13100247
[19] Google. 2024. Google Lookout. https://support.google.com/accessibility/android/answer/9031274?hl=en. Accessed: April 10, 2025.
[20] Google. 2024. TalkBack Screen Reader for Android. https://support.google.com/accessibility/android/answer/6283677?hl=en Accessed: 2025-04-15.
[21] Government of India. 2009. The Right of Children to Free and Compulsory Education Act, 2009. https://legislative.gov.in/sites/default/files/A2009-35.pdf. Accessed: April 14, 2025.
[22] Arnab Kundu and Tripti Bej. 2021. Technology adoption in Indian national education policy 2020: An analysis of pedagogical, institutional, and human aspects. *Journal of Social Sciences* 17, 1 (2021), 145–157. doi:10.3844/jssp.2021.145.157
[23] Simi Mehta, Anshula Mehta, and Arjun Kumar. 2022. Need to prioritize eye health in India. https://www.counterview.in/2022/10/need-to-prioritize-eye-health-in-india.html
[24] Memrise. [n. d.]. Memrise: Language Learning App. https://www.memrise.com/. Accessed: 2025-04-10.
[25] Microsoft. 2024. Seeing AI. https://www.microsoft.com/en-us/ai/seeing-ai. Accessed: April 10, 2025.
[26] Ministry of Education, Government of India. 2020. Samagra Shiksha: Framework for Implementation. https://dsel.education.gov.in/sites/default/files/Samagra_Shiksha_Framework.pdf. Accessed: April 14, 2025.
[27] Ministry of Education, Government of India. 2023. Digital Infrastructure for Knowledge Sharing (DIKSHA). https://diksha.gov.in/. Accessed: April 14, 2025.
[28] Lalima Mishra. 2020. Status of Inclusive Education in India: A Critical Analysis. *Journal of Education and Development* 10, 2 (2020), 11–20. doi:10.30954/2231-458X.02.2020.2
[29] Tarini Naik, Meena Elapulli Shankaranarayanan, Manohar Swaminathan, Kalika Bali, and Mohit Jain. 2024. Examining Factors Influencing Technology Integration in Indian Classrooms: A Teachers' Perspective. *ACM J. Comput. Sustain. Soc.* 2, 3, Article 35 (Sept. 2024), 29 pages. doi:10.1145/3677325
[30] National Council of Educational Research and Training. 2020. *Enabling the Disabled: A Handbook for Inclusive Education.* NCERT, New Delhi. https://ncert.nic.in/pdf/publication/otherpublications/iecpddmp301.pdf Accessed: April 14, 2025.
[31] NV Access. 2024. NVDA - NonVisual Desktop Access. https://www.nvaccess.org/ Accessed: 2025-04-15.
[32] OpenAI. 2022. Introducing ChatGPT. https://openai.com/index/chatgpt/ Accessed: 2025-04-09.
[33] OrCam Technologies. 2024. OrCam MyEye. https://www.orcam.com/en/myeye/. Accessed: April 10, 2025.
[34] Perkins School for the Blind. 2023. How Blind Teachers and Students are Using ChatGPT. https://www.perkins.org/resource/how-blind-teachers-and-students-are-using-chatgpt/
[35] Roshni Poddar, Tarini Naik, Manikanteswar Punnam, Kavyansh Chourasia, Rajeswari Pandurangan, Rajesh S Paali, Nagarathna R Bhat, Bhagyashree Biradar, Venkatesh Deshpande, Devidatta Ghosh, Sudipta Ray Chaudhuri, Dipanjan Chakraborty, Amit Prakash, and Manohar Swaminathan. 2024. Experiences from Running a Voice-Based Education Platform for Children and Teachers with Visual Impairments. *ACM J. Comput. Sustain. Soc.* 2, 3, Article 34 (Sept. 2024), 35 pages. doi:10.1145/3677323
[36] Aaron Rafferty. 2023. How Will the Use of AI in Education Impact the Roles of Teachers? https://thelearningcounsel.com/articles/how-will-the-use-of-ai-in-education-impact-the-roles-of-teachers/
[37] Nimmi Rangaswamy. 2011. ICT for Development and the Bottom of the Pyramid: Critical Perspectives from the Field. In *Proceedings of the 10th International Conference on Human Computer Interaction with Mobile Devices and Services*. 75–84. doi:10.1145/1999030.1999051
[38] Vision Empower Trust (VE). 2025. [Title Redacted for Anonymisation]. URLwitheldforreview
[39] Vision Empower Trust (VE). 2025. [Title Redacted for Anonymisation]. URLwitheldforreview
[40] RightHear. 2024. RightHear - Audio guidance for the visually impaired. https://www.right-hear.com/. Accessed: April 10, 2025.
[41] Riiid. [n. d.]. Riiid: AI Solutions for Education. https://riiid.com/. Accessed: 2025-04-10.
[42] William A. Sahlman, Allison M. Ciechanover, and Emily Grandjean. 2023. Khanmigo: Revolutionizing Learning with GenAI. Harvard Business School Case 824-059. Revised April 2024.
[43] Sana Labs. [n. d.]. Sana Labs: AI-powered Personalized Learning Platform. https://sanalabs.com/. Accessed: 2025-04-10.
[44] Freedom Scientific. 2024. JAWS Screen Reader. https://www.freedomscientific.com/products/software/jaws/ Accessed: 2025-04-15.
[45] P. Sharma. 2021. Experiences of college teachers with visual disability using AT and AI-based solutions in India: Benefits, Issues, Challenges and Prospects. In *Journal of Physics: Conference Series*, Vol. 2007. IOP Publishing, 012050. https://doi.org/10.1088/1742-6596/2007/1/012050 Accessed: April 10, 2025.
[46] Shamini Shetye. 2024. An Evaluation of Khanmigo, a Generative AI Tool, as a Computer-Assisted Language Learning App. *Studies in Applied Linguistics and TESOL* 24 (jul 2024). doi:10.52214/salt.v24i1.12869
[47] Squirrel AI. [n. d.]. Squirrel AI: AI-Powered Adaptive Learning System. https://squirrelai.com/. Accessed: 2025-04-10.
[48] Business Standard. 2022. India loses 118 billion dollars annually in GNI due to childhood blindness: Report. https://www.business-standard.com/article/current-affairs/india-loses-118-bn-annually-in-gni-due-to-childhood-blindness-report-122090901204_1.html
[49] Heather Sullivan and Susan Fitts. 2022. Barriers to equitable assessment for students with visual impairments. *Journal of Blindness Innovation and Research* 12, 1 (2022). https://nfb.org/images/nfb/publications/jbir/jbir22/jbir1201.html Accessed: April 14, 2025.
[50] Supersense. 2024. Supersense AI. https://www.supersense.app/. Accessed: April 10, 2025.
[51] Teachmint. [n. d.]. Teachmint: Teaching App for Online & Offline Classes. https://www.teachmint.com/. Accessed: 2025-04-10.
[52] Unacademy. [n. d.]. Unacademy: India's Largest Learning Platform. https://unacademy.com/. Accessed: 2025-04-10.
[53] UNESCO New Delhi. 2019. Nurturing Inclusive Education in India. https://unesdoc.unesco.org/ark:/48223/pf0000372228. Accessed: April 14, 2025.
[54] UNICEF and ITU. 2020. How many children and young people have internet access at home? https://data.unicef.org/resources/children-and-young-people-internet-access-at-home-during-covid19/. Accessed: April 10, 2025.
[55] U.S. Department of Education. 2023. Building and Sustaining Inclusive Educational Practices Aligned with the Department's Policy Statement on Inclusion of Children with Disabilities. https://www.ed.gov/media/document/inclusive-practices-guidance-109436.pdf. Accessed: 2025-04-14.

[56] Rama Adithya Varanasi, Aditya Vashistha, and Nicola Dell. 2021. Tag a teacher: A qualitative analysis of WhatsApp-Based teacher networks in low-income Indian schools. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM, Yokohama, Japan, 1–16. doi:10.1145/3411764.3445221
[57] Rama Adithya Varanasi, Aditya Vashistha, Rene F. Kizilcec, and Nicola Dell. 2021. Investigating technostress among teachers in low-income Indian schools. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (2021), 1–29. doi:10.1145/3476081
[58] Rama Adithya Varanasi, Aditya Vashistha, Tapan Parikh, and Nicola Dell. 2020. Challenges and issues integrating smartphones into teacher support programs in India. In *Proceedings of the 2020 International Conference on Information and Communication Technologies and Development (ICTD'20)*. Association for Computing Machinery, Guayaquil, Ecuador, Article 10, 11 pages. doi:10.1145/3392561.3394638
[59] Voice Dream. 2024. Voice Dream Scanner. https://www.voicedream.com/scanner. Accessed: April 10, 2025.
[60] World Bank Group. 2022. Every Learner Matters: Unpacking the Learning Crisis for Children with Disabilities. https://blogs.worldbank.org/en/sustainablecities/every-learner-matters-unpacking-learning-crisis-children-disabilities. Accessed: April 10, 2025.

Appendix A: Interview and Survey Instruments

A.1 Semi-Structured Interview Guide

The following sample questions were used to guide semi-structured interviews with TVIs. Questions were adapted in real time based on participants' responses.

Demographics and Contextual Background

- What is your highest qualification?
- What grades and subjects do you currently teach?
- How many years of teaching experience do you have?

Teaching Preparation and Practices

- How do you typically prepare for a lesson?
- Do you modify or personalize content for different students or grades?
- Do you use any technology to assist with preparation or in-class teaching?

Technology Use and Support

- What role does technology play in your own learning or professional development?
- Have you received any teacher training related to technology use?
- Are you part of any teacher forums or support groups (e.g., on WhatsApp)?

Exploration of Generative AI Tools

- Have you heard about or tried using tools like ChatGPT or Be My Eyes?
- What do you think would help you use such tools more effectively?

A.2 Sample Survey Questions

The survey questionnaire contained both closed- and open-ended questions across four themes. Below are sample items from each theme:

General Information

- **What is your gender?**
  Option 1: Woman; Option 2: Man; Option 3: Non-binary/gender diverse; Option 4: Self-described; Option 5: Prefer not to say
- **In which state do you currently teach?**
  Option: List of all Indian states and union territories
- **How many years of teaching experience do you have?**
  Option 1: Less than 5 years; Option 2: 5–10 years; Option 3: 10–15 years; Option 4: More than 15 years
- **Which of the following degrees do you hold? (You can choose multiple options)**
  Option 1: D.Ed; Option 2: Special D.Ed; Option 3: B.Ed; Option 4: None of the above
- **Which subjects do you teach? (You can choose multiple options)**
  Option 1: Hindi; Option 2: English; Option 3: Mathematics; Option 4: Science; Option 5: Environmental Studies; Option 6: Art; Option 7: Music; Option 8: Regional Language; Option 9: Braille; Option 10: Mobility Training; Option 11: Other

- **What is the average number of students in your class?** Option 1: 5-7; Option 2: 8-10; Option 3: 10–15; Option 4: More than 15
- **Do you have combined classes?** Option 1: Yes; Option 2: No

Preparation to Teach

- **How do you prepare for your classes?**
  Option 1: I create a plan for every session based on the previous one;
  Option 2: I decide what to teach weekly;
  Option 3: I create a plan at the beginning of the academic year;
  Option 4: I decide what to teach on a monthly basis
- **How do you make your lesson plans?**
  Option 1: I use a Brailler; Option 2: I create a document on my phone/laptop; Option 3: I write it by hand
- **How do you gauge the effectiveness of your lesson plan? (you can choose multiple options)** Option 1: I use a Brailler; Option 2: I create a document on my phone/laptop; Option 3: I write it by hand Option 1: Student participation/response; Option 2: Learning outcomes; Option 3: Completion of required academic syllabus; Option 4: Student exam scores
- **Do you use technology for preparing for classes?** Option 1: Yes; Option 2: No
- **How do you use technology for preparation? (You can choose multiple options)** Option 1: I refer to YouTube videos; Option 2: I read articles and books online; Option 3: I use WhatsApp to communicate with other teachers and understand new concepts; Option 4: I use Google to find relevant information; Option 5: Other

Teaching

- **In the last week how often have you used technology for teaching?** Option 1: Very frequently; Option 2: Regularly; Option 3: Occasionally; Option 4: Rarely
- **What kind of technology do you use in class? (you can choose multiple options)** Option 1: Personal Smartphone; Option 2: Laptop; Option 3: Radio/Speaker; Option 4: Smart board; Option 5: Other
- **Which of the below resources do you use for teaching? (you can choose multiple options)** Option 1: YouTube; Option 2: Google; Option 3: Diksha Portal; Option 4: Subodha; Option 5; Other

AI Knowledge

- **Do you use ChatGPT?** Option 1: Yes; Option 2: No
- **What do you use ChatGPT for? (Mention your top 5 use cases)**
- **Do you use Be My Eyes?** Option 1: Yes; Option 2: No
- **What do you use Be My Eyes for? (Mention your top 5 use cases)**
- **Have you tried Be My AI?**