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“Easing Education for Visually Impaired Children in Rural Telangana”

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Easing Education for Visually Impaired Children in Rural Telangana

Abstract

The education of children with visual impairments (CVI) in India, particularly within rural Telangana, is currently stuck in a logistical and economic bottleneck that can be characterized as a "book famine." Despite legislative advancements such as the Rights of Persons with Disabilities (RPwD) Act, 2016, and the National Education Policy (NEP) 2020, the infrastructure for inclusive education remains dependent on physical production of Braille, which is a medium that is resource-heavy, logistically cumbersome, and increasingly fiscally unsustainable. This research interrogates the viability of a shift from physical Braille to a digital-first ecosystem driven by Refreshable Braille Displays (RBDs), especially within the context of shortages of special educators in rural Telangana. The study employs a convergent parallel mixed-methods research design by integrating primary qualitative data collected from the Devnar School for the Blind, Hyderabad and a rigorous field survey of 9 mainstream educational institutions across 5 villages in Telangana with primary quantitative data collected from a public perception survey (N=148). Further, it utilises secondary data from market reports to conduct a rigorous Lifecycle Cost Analysis (LCA). The economic findings reveal that while digital intervention necessitates a higher initial Capital Expenditure (CAPEX) of approximately ₹25,000 per unit, the near-zero Operational Expenditure (OPEX) results in a break-even point at Year 6 and a 28% reduction in the Total Cost of Ownership (TCO) over a ten-year educational cycle (Class 1 to Class 10). However, the field investigation in the villages of Rudraram, Indrakaran, Isnapur, Nandigama, and Bhanur uncovers a critical systemic failure. Across four private and four public institutions surveyed, there was zero enrollment of VI students and, crucially, zero special educators available to facilitate inclusion. The convergence of these findings suggests that while

technology offers a fiscal solution to the material resource gap, the human resource gap of trained special educators remains the primary barrier to implementation. Consequently, this paper recommends migrating assistive technology funding to the Ministry of Education (MoE) budget and requests immediate recruitment and deployment of special educators as a prerequisite for the technological upgrade. This ensures that digital tools serve as pedagogical bridges rather than remaining as unused assets.

1. Introduction

Access to information is a fundamental right of every citizen. It is a prerequisite for social mobility, meaningful civic engagement, and economic participation. Yet, for an estimated 4.95 million blind individuals and the significantly larger population of visually impaired (VI) persons in India, this access gets severely limited (Mannava et al., 2022). This limitation primarily occurs due to the financial unviability of printing Braille, logistical difficulty in distributing it and the state's inability to educate children with visual impairments (CVI). Overall, this crisis can be described as a "book famine."

1.1 Understanding the impact of a book famine

This is a global phenomenon. "Less than 1% [of published materials] in developing countries are ever made available in accessible formats ... [like] Braille, large print, or audio" (Reid, 2017). This constitutes a systemic failure of the state's educational apparatus. The sighted world has already transitioned to a digital space where information is instantaneous, ubiquitous, and virtually free to reproduce. However, the educational space for CVI, with the rare exception of a few institutions, remains stuck in methodologies dating back to the 19th century.

Refreshable Braille Displays (RBDs) offer an upgrade from these outdated methods.

Particularly, the over-reliance on physical Braille books presents a multifaceted logistical

challenge that permeates through the entire educational ecosystem of Telangana. Braille embossing is an expensive, industrial process which requires heavy paper stocks (120 and 150 GSM) and specialized machines. A standard 200-page textbook, when transliterated into Braille expands into three to four bulky volumes due to the spatial requirements of the Braille cell. This expansion presents several challenges in the storage, transportation and durability of Braille books. Educators interviewed for this study reveal that they had to set up their own units for printing physical books due to printing backlogs at centralized presses (H., personal communication, 2025), placing VI students at a permanent disadvantage. In contrast, their sighted peers can access digital textbooks instantly through “platforms like DIKSHA” (R., personal communication, 2025). This phenomenon is not just an administrative inconvenience but a structural barrier that further exacerbates the learning gap between CVI and their sighted peers. Hence, a declining trend in the number of enrollments of children with special needs (CwSN), which includes VI students, after completion of secondary education is noted from the Unified District Information System for Education (UDISE) database of 2023-24 (Department of School Education & Literacy (DSEL, 2024). This is not a problem of only Telangana, but India.

The transition to digital Braille is not just about replacing paper but aiding in the improvement of these enrollment ratios in secondary education as a VI student gets connected to the infinite library of the internet. This truly democratizes access to information. India’s ratification of the *Marrakesh VIP Treaty* (2016) dismantles the barriers of Braille book availability by providing copyright exceptions that facilitate creation and cross-border exchange of accessible works. Domestically, the legislative framework has evolved from its 1995 silo with the passage of the Rights of Persons with Disabilities (RPwD) Act, 2016 and the National Education Policy (NEP), 2020 that have codified the right to inclusive education. The NEP

(2020), in particular, emphasizes on the usage of technology to bridge gaps for socio-economically disadvantaged groups (SEDGS), quite explicitly advocating for the development of “barrier-free access” and “appropriate” teaching-learning materials (TLM) (Ministry of Human Resource Development [MHRD], 2020).

1.2 Overview of the policy context

In Paragraph 56 of the Supreme Court Record (SCR) of the case of *Rajneesh Kumar Pandey & Ors. v Union of India & Ors* (2021), Justice A. M. Khanwilkar observed that:

“The persons with disabilities in India constitute over 2.21 per cent of the total population of the country, as per the census figures of 2011 ... [and] there are 22.5 lakh CwSN in the country [as per the UDISE data.] ... Further, only 4.33 lakh general teachers have been trained to teach CwSN in addition to teaching general children and only 28,535 special teachers are available for children with special needs/CwSN.”

The observation depicts a critical disconnect between the intent of policies and implementation reality. For instance, a funding silo exists for assistive technology (AT) as it is traditionally categorized under the Assistance to Disabled Persons for Purchase/Fitting of Aids/Appliances (ADIP) Scheme managed by the Department of Empowerment of Persons with Disabilities (DEPwD, 2022) of the Ministry of Social Justice and Empowerment (MoJSE). In contrast, education falls under the Samagra Shiksha Abhiyan (SSA) of the Ministry of Education (MoE). The “camp-based” distribution model of the “ADIP SSA” (MoE, 2025) is suited for prosthetics or wheelchairs, which are one-time provisions. However, educational technology needs continuous upgrades, maintenance and integration with the curriculum. These functions are better aligned with the MoE’s mandate but are currently outside its procurement channels. This structural mishap results in a scenario where distributing AT devices is treated as gifts

rather than essential educational items. A lack of pedagogical integration of RBDs will mean that while a VI student may receive scholarship to attend school from the MoE, the essential tool required to read (RBD) is governed under a separate ministry, MoJSE, which has its own budgetary and distribution constraints.

Even mere access to RBDs won't solve the issue as there is a severe lack of special educators in both public and private institutions. On 28 October, 2021, in the Supreme Court case of *Rajneesh Kumar Pandey & Ors. v Union of India & Ors*, the court directed for maintenance of a pupil-to-teacher ratio (PTR) of 1 special educator for every 10 CwSN (1:10) for the primary level (class 1 to 5) and another one for every 15 CwSN (1:15) for the upper primary level (class 6 to 8). Even the NEP (2020) notes the definition of “inclusive education” (as per the RPwD Act, 2016) in its paragraph 6.10 which envisions a “system of education wherein students with and without disabilities learn together and learning is suitably adapted to meet the learning needs of different types of students with disabilities.” The Right of Children to Free and Compulsory Education (RTE) Act, 2009 had also promised in its Section 3 that “every child” has the right “in a neighbourhood school” and its subsequent amendment in 2012 clarified that this right extends to children with disabilities. Further, the RPwD Act “endeavour[s]” that all educational institutions funded or recognised by [the appropriate Government and local authorities]” (see Section 16, Chapter III) will make provisions to ensure that children with disabilities are included within the ordinary school system.

The ambitious dream of the legislation and policy is not translated on the ground due to lack of implementation, often due to fiscal inefficiency. This study evaluates if RBDs can serve as a feasible solution to reduce the cost of education for the state by reducing the heavy dependency on special educators. It supports the ecosystem of a special educator for a “cluster of

schools” by leveraging the process of self-learning that is provided by a Braille tablet for CVI.

1.3 Problem statement

The central problem addressed by this research is solving the *status quo* of fiscal and pedagogical inefficiency of the model of education employed by the state for CVI in Telangana. It aims to address the severe shortage of relevant human capital in rural areas. The present model relies on physical Braille books which are relatively cheap initially but have high and recurring operational expenditures (OPEX). They also take up a lot of space as they are heavy and thick causing significant logistical friction which acts like a “storage tax” on public schools. Conversely, a digital intervention through RBDs offers a potential solution by compressing entire libraries into a single device and eliminating a lot of the OPEX.

However, the high capital expenditure (CAPEX) of RBDs, which cost between ₹30,000 and ₹50,000 per unit, acts as a formidable barrier to their adoption in government schools. The school administrators may experience a ‘maintenance anxiety’, i.e., a fear that these expensive devices may become paperweights upon the first malfunction. That will inevitably, further paralyze the digital transition. Furthermore, the anecdotal evidence within this study suggests that the physical absence of special educators in mainstream schools will render any discussion of technology moot. If there is no teacher to instruct the child in Braille literacy or device usage, the technology becomes irrelevant. Thus, the problem is twofold as there is a gap in material resources alongside a significant gap in human resources, which is, a lack of special educators.

1.4 Research objectives

The primary research question driving this study is whether the adoption of RBDs and associated technologies reduce the long-term per-capita cost of education of CVI for the state of

Telangana while parallely enhancing the students' learning outcomes and inclusion into the digital space. It also evaluates the structural barriers for this adoption in rural settings.

To rigorously answer this question, the study pursues the following specific objectives:

- a) To investigate the ground realities of inclusive education implementation in rural Telangana through a survey of public and private educational institutions whilst focusing on enrollment numbers and the availability of special educators.
- b) To statistically analyze the public's attitude regarding the capability of VI students and the government's fiscal responsibility in providing tech solutions, which aids in determining the social license for such public expenditure.
- c) To perform a Lifecycle Cost Analysis (LCA) that compares fiscal feasibility of traditional Braille books against digital Braille tablets over a ten-year schooling cycle (Class 1-10), while identifying the break-even point and total cost of ownership (TCO).

2. Literature review

Ajit Dalal (2010) reveals that a cyclical economic phenomenon called “disability-poverty trap” exists where disability increases the likelihood of poverty, and, in turn, poverty increases the likelihood of disability. In the context of education, this trap manifests through exclusion. Without access to accessible educational materials, students with visual impairments are unable to acquire the literacy and numeracy skills required for the modern workforce. Furthermore, Mitra & Sambamoorthi (2006) indicate that the “workforce participation rate of persons with disabilities in India is as low as 37.6% compared to 62.5% for the general population”. Mannava et al. (2022) highlight that the economic burden of this exclusion is staggering, estimating “a cumulative loss of Gross National Income (GNI) due to blindness in India to be INR 11,778.6 billion”.

Literature on the economics of education suggests that assistive technology acts as a "force multiplier" for productivity (Fitas, 2025). By enabling independent access to information, digital tools allow visually impaired individuals to compete for high-skill jobs rather than being relegated to low-skill, manual labor sectors traditionally reserved for the blind, such as chair caning or basket weaving. A classic "welfare" model views disability aids as a sunk cost, a charitable expense to support a dependent population. In contrast, the "investment" model views assistive technology as capital expenditure that yields returns through increased tax revenue and reduced welfare dependency in the long term. Mitra (2006) aligns Amartya Sen's capability approach with disability, where the focus is not on disability itself but more on the capability set that is available to an individual to function in society. Technology expands this capability set, converting a disabled individual into a productive economic agent.

3. Methodology and database

3.1 Research design

This study utilises both primary and secondary data. It adopts a convergent parallel design approach where quantitative and qualitative data are collected simultaneously, analyzed separately and merged later to gain a holistic view of the research question. This design is adopted due to its high relevance when employing a mixed approach for a policy problem, that requires combining statistical rigour for a financial analysis alongside a nuanced understanding of the context in which the policy operates to develop implementation strategies.

3.2 Public perception survey

This study gathered quantitative data through a digital survey titled '*Vision Beyond Sight: A Survey for Gathering Public Opinion on Technology and the Future of Education*' (see appendix 1). The raw data comprises 148 respondents whose views were collected through

snowball sampling and cannot be generalized over the entire population. Hence, detailed statistical analysis is performed on a core subset of 25 complete responses for specific Likert scale items to ensure data integrity. The survey measured the respondents' attitudes across five dimensions: capability of VI persons, government responsibility, social interaction, investment choices (tablet versus books), and funding sources. Statistical tools like mean, skewness and kurtosis are employed to observe and analyze the distribution of the respondents' opinions.

3.3 Field investigations

Interviews and field observations comprise a major component of this study to ground the analysis with the educational realities of rural Telangana. Collecting such primary data was important to test the assumptions of policy solutions against the ground reality.

Sites were selected, subject to time and resource constraints, around the semi-urban and rural landscape surrounding the city of Hyderabad. A cluster of five villages (Rudraram, Indrakaran, Isnapur, Nandigama and Bhanur) in the Sangareddy district of Telangana were chosen. The proximity of these villages to the city acts as a limitation as peri-urban areas mask the deep resource deficits that remote villages face in districts which are geographically distant from urban hubs. This contrast was starkly visible in the high amount of corporate social responsibility (CSR) funds that the schools in the respective villages had received. Additionally, the Devnar School for the Blind, near Begumpet, Hyderabad was used as a control site for best practices in inclusive education, providing a benchmark for what is possible.

The field visits covered ground of 9 educational institutions, spread across 5 villages, whose names are omitted to uphold the privacy of interviewees. The sample is fairly balanced with 5 public and 4 private institutions to identify if exclusion of CVI is a funding constraint or a broader systemic issue. Additionally, all the chosen institutions cater to secondary, senior

secondary or higher secondary education ranging from grades 6 to 12. The private institutions vary from ‘budget private schools’ to ‘corporatized junior college’ models which are prevalent in the state. The public institutions represent the backbone of the state education system.

Semi-structured interviews were conducted with key stakeholders including principals, senior faculty members and administrative staff. One focus group discussion among 10 members including faculty from different streams, administrative staff and school management was conducted to understand the group’s attitude. Broadly, the inquiry aimed to gather enrollment statistics of CVI, availability of special educators, and the general awareness and preparedness of the institutions for inclusive education. For the Devnar School, interviews focused on the pedagogical impact of Braille technology and the user experience of students and teachers.

3.4 Usage of secondary data

Despite adequate collection of primary data, the study required cost data from market rates and government expenditure reports to develop a Lifecycle Cost Analysis (LCA). The study develops a comparative LCA to contrast traditional braille paper with RBDs over a ten-year horizon (Class 1 to Class 10) for a single beneficiary. Specifically, the cost data of Braille printing, device procurement (like Orbit Reader 20) and maintenance are derived and estimated. The LCA considers capital expenditure (CAPEX), operational expenditure (OPEX), logistics, replacement costs (due to wear and tear), and the reusability factor of these assets. A “storage tax” gets qualitatively factored through the concerns received in the educator interviews.

4. Analysis of findings

4.1 Zero Enrollment or Zero Special Educators?

The field visits and interviews with stakeholders across the 9 high schools in Rudraram, Indrakaran, Isnapur, Nandigama and Bhanur present an unsettling picture of inclusive education

in rural Telangana. There was not a single VI student enrolled alongside a complete absence of special educators. Although, the RPwD Act “endeavour[ed]” that public institutions should “admit [children with disabilities] without discrimination” (see Section 16 (i)) and “train and employ teachers ... who are qualified in ... Braille” (see Section 17 (c)), the survey revealed a pattern of absolute exclusion of CVI. There is more than meets the eye here.

The exclusion does not stem from deliberate, discriminatory attitudes in all cases but a more systemic issue. The following response captures this phenomenon:

“Actually, no one (CVI) comes here for admission ... They have their separate schools”
 said R., a faculty member with 23 years of teaching experience in a public school in
 Indrakaran village, Telangana during a focus group discussion.

This response represents a near consensus amongst all the stakeholders, spanning both private colleges and government-run high schools. This finding of zero enrollment is statistically significant given the prevalence of VI in the general population. The respondents were unaware of any VI children that even resided in the neighbourhood. This finding represents a phenomenon where CVI in these peri-urban and rural areas are either never entering the education system, completely dropping out when primary level of education is obtained or are being segregated into special schools far away from their “neighbourhood”. All of these scenarios are contrary to the idea of inclusion. The NEP 2020 accords the “highest priority” to the “inclusion of and equal participation of children with disabilities in ... the schooling system” (para 6.10). However, the absence of CVI as students in mainstream education confirms that an “inclusive education” model remains largely theoretical in rural areas.

This critique is further supported by a complete absence of special educators for VI students. With the exception of one public institution that had a special educator, who was

nonetheless untrained to handle visual impairment, none of the schools had any trained faculty to support students with disabilities. This substantiates with broader state-level data that indicates a severe shortage of special educators in Telangana.

According to the UDISE database, in the year 2023-24, Telangana had 64,675 CwSN enrolled in elementary education, i.e., classes 1 to 8 (DSEL, 2024), while having only 2,340 special educators (Ministry of Education, 2021, as submitted in an affidavit to the Supreme Court). This means that there is only one special educator for every 28 CwSN (approximate value of 27.6). This does not achieve the Supreme Court's direction for a PTR of 1:10 for primary level (Class 1 to 5) and 1:15 for upper primary level (6 to 8) as established in the *Rajneesh Kumar Pandey & Ors. v Union of India* (2021). The government attempted to close the gap in the ratio by filling vacancies through direct recruitment, 796 in primary level and 220 in upper primary level (PTI, 2024). Despite the addition of these 1,016 special educators, the PTR would only be reduced up till 1:19 (approximate value of 19.27) which still does not fulfill the demand made in the Supreme Court. Even if the ratio improves, unfortunately there is no guarantee that a special educator would be trained in handling CVI.

This strengthens the assumption generated from the field visits that various institutions use the leverage of a “cluster school” approach as an excuse to not appoint any special educators. There exists not a single trained professional to address the needs of CwSN, especially CVI. This creates a chicken-and-egg scenario where VI students do not enroll because there are no teachers and schools do not hire special educators because there are no students opting for admission. This is the unfortunate ground reality.

Qualitative studies further highlight a knowledge gap in the admission process amongst the faculty and staff of both public and private institutions. The managements, especially of

private institutions, expressed uncertainty and confusion about how to accommodate a VI student if one were to apply, citing lack of infrastructure, staff or any government guidance. This knowledge gap acts as a silent gatekeeper to keep segregating VI students from obtaining free and compulsory education in a “neighbourhood school”. The private schools, despite having vastly superior financial resources, showed no greater inclination towards inclusion than the resource-starved public schools. The barrier is more systemic and attitudinal, not just financial.

4.2 Mapping the Public Perception

As stated earlier, the survey employed a core dataset (N=25) for statistical analysis to offer a perspective to the social context in which the policies recommended in this paper would operate. Overall, the data reveals a strong public mandate for technological intervention but is polarized in the mode of funding the suggestions that this study proposes. Table 1 summarizes the central leaning (Mean), asymmetry (Skewness) and distribution (Kurtosis) of the public opinion for five dimensions. These dimensions were mapped through a Likert scale which required respondents to signal the strength of their agreement on a scale of 1 to 5 (from ‘1=Strongly Disagree’ to ‘5=Strongly Agree’) for five statements (check appendix 1).

Near consensus in competence: A mean of 3.72 with a negative skew (-0.37) indicates a general consensus amongst the respondents that VI individuals are capable of working as fast as their sighted peers if given the right opportunity, especially with the right technology. The negative kurtosis (-1.09) suggests a platykurtic distribution, meaning that while the average is positive, opinions are spread out. Hence, even if the majority is supportive, there exists a segment within the population which is skeptical or uninformed of the capabilities of assistive technology. This highlights a need for awareness campaigns alongside policy changes.

A mandate for government intervention: The high mean of 3.88 for ‘government responsibility’ is a critical finding. It suggests that a strong political capital exists in government spending, even on up-front expensive assistive devices. However, the highly negative kurtosis (-1.38) indicates a very flat distribution, meaning the opinions are polarized. While many may strongly agree, a substantial group may believe that this is not the government's burden (perhaps preferring CSR, as seen in data for ‘funding sources’). This polarization suggests that the policy communication must frame this expenditure as an “investment” in education infrastructure rather than “welfare” for the visually impaired to garner broader support.

Tablets as preferred investment: This question yielded the highest mean (3.92) and the strongest skew (-0.83), indicating a decisive public preference for investing in digital tablets over physical Braille books. The kurtosis (-0.27) is closer to zero (mesokurtic), suggesting this is an even more unified consensus than the other questions. Qualitatively the respondents frequently used statements like “technology bridges the gap ... [and] get them on a [sic] same platform.” This depicts that there is a public understanding of technology as an equalizer of opportunity rather than being a compensatory tool. Another statement: “... equips them to be able to function independently and finding [sic] a means of earning their income” was a recurring sentiment. The respondents opine that the future is digital and investing in just Braille paper is inefficient.

Social dynamics: The positive skew (0.81) for ‘social interaction’ is encouraging. It means that the bulk of the respondents are concentrated on the end of disagreement. Most respondents do not find interacting with VI persons awkward. This slightly challenges the narrative that social stigma is the primary barrier to inclusion, shifting the focus back to structural and technological barriers. However, care needs to be taken while jumping to this

conclusion as, in spite of an anonymized collection of data, respondents may not respond accurately and behave differently when actually interacting with a VI individual.

Table 1: Summary of the statistical parameters derived from the Likert scale responses (N=25)

Dimension	Mean	Skewness	Kurtosis
Capability of VI persons	3.72	-0.37	-1.09
Government responsibility	3.88	-0.19	-1.38
Social interaction	2.24	0.81	-0.58
Investment Choice (Tablets versus books)	3.92	-0.83	-0.27
Funding Sources	3.64	-0.79	0.14

Source: Computed by the Author from the primary data collected in the survey (appendix 1).

This can be gathered in their responses to other questions (see appendix 1) where 17.6% of respondents have never seen a VI student studying and 48.6% are either not sure or feel it's impossible for VI individuals to use social media. This contrasts well with the observation at Devnar School for the Blind, where H., a teacher with more than 20 years of experience in teaching CVI told that:

“Yes, just the other day a student was using social media. We need to strictly monitor their mobile usage. These older ones enjoy scrolling reels and listening to the funny sounds.”

Demand for CSR: While there is strong support for the government to take up the responsibility (visible in a mean of 3.88), the opinions are distributed in a platykurtic fashion (with a kurtosis of -1.38) regarding tax-based funding. This indicates quite a polarized view, with

a significant proportion of the respondents preferring CSR funding over taxpayer money. This implies that while the public supports the idea of digital inclusion for education, there is a different consensus on who should pay for it. Policymakers can look at ideas like public private partnerships (PPP) to drive digital inclusion of CVI in government-run and private schools.

4.3 Insights from the Devnar School

In contrast to the schools in the rural and peri-urban areas, the field visit in the Devnar School for the Blind highlights the transformative potential of technology when all the human infrastructure like special educators and a supportive, inclusive management are in place.

L., a computer science teacher with 8 years of experience with CVI informed how various CVI attain a speed of typing 30 words per minute (wpm) when they start learning from grade 5 onwards. There is a profound shift in the pedagogy to ensure adoption of digital tools to enhance the employability prospects of the students. H., Principal of Devnar School for the Blind informed that Braille is mandatory up till grade 6, following which various students attempt to resume higher education from mainstream institutions. There was a sense of confusion and hesitation in adopting digital Braille tablets as they feared that it would be harder for VI students to transition to ordinary devices in the workplace environment. This sheds light on the need to design Braille tablets which can take inputs from a normal keyboard while also incorporating the audio-output devices to facilitate use of softwares like MS Office, Gmail, etc.

The technological shift is revolutionary for students. The need to use social media emerged as a dominant theme in interactions. A grade 8 female student with visual impairment complained that physical Braille books limit them to very specific content provided by the school. She highlighted how she wanted to access the internet independently and explore all the

information out there. This enthusiasm of VI students for using technology is visible in the following anecdote narrated by L., the computer science faculty:

“The audio tools have a very robotic voice ... despite that the child has created this presentation. Look, how enthusiastically he has even put the animations in every slide. He loves those sounds.”

This highlights the responsibility of policymakers and developers of Braille tablets to ensure the accessibility of social media and internet for VI students to allow them to equally participate with their peers and break the present asymmetry of information. It is crucial to break the isolation associated with visual impairment and move towards inclusion.

4.4 A Lifecycle Cost Analysis (LCA) for RBDs (see Table 2)

The LCA provides a fiscal justification for transitioning to digital Braille. Table 2 compares the costs, over a 10-year period, associated with Braille paper against a RBD for a single student. The data reveals a break-even point can be achieved after Year 6. For the first five years, the paper model appears cheaper due to the high upfront cost of the tablet. However, as the recurring costs of paper, printing, and shipping accumulate, the digital model becomes cheaper. By the end of Class 10, the state saves approximately ₹13,000 per student, representing a 28% reduction in the Total Cost of Ownership (TCO). This analysis demonstrates that the high initial cost of technology is an illusion when viewed through a long-term fiscal lens.

The analysis assumes current retail pricing (see Orbit Research, 2024, CSRBOX, 2024). If the government were to procure these devices in bulk under the *Samagra Shiksha Abhiyan* (e.g., a tender for 1,00,000 units), unit economics suggest that the price could drop by 30-40%. This will reduce the CAPEX to roughly ₹15,000. This could further shorten the Return on

Investment (ROI) period to just three years, making the transition economically viable within a single government's term.

Table 2: A comparative Lifecycle Cost Analysis (LCA) of traditional paper Braille against a Braille tablet (or RBD) over a ten-year time period for a single VI student

Cost Head	Traditional paper Braille	RBD (Braille Tablet)
Capital expenditure (CAPEX)	₹0	₹25,000
Operational expenditure (OPEX)	₹30,000 (Printing 10 yrs)	₹2,000 (Maintenance)
Logistics & distribution	₹10,000	₹0
Replacement costs	₹5,000	₹5,000
Total cost over 10 years	₹45,000	₹32,000

Source: Computed by the Author by accounting for prevalent market rates and field survey

Conclusion

The "book famine" is not inevitable but a choice, maintained by the state's inertia of action. This research demonstrates that continued reliance on physical Braille is not only pedagogically limiting but economically inefficient. The digital transition, facilitated by Refreshable Braille Displays (RBDs), offers a path to lower long-term costs, greater logistical efficiency, and, most importantly, genuine inclusion for children with visual impairments (CVI). The public supports this shift, and the economics favors it.

However, the field investigation in rural Telangana serves as a sobering reality check. The vision of a digital-first, inclusive education system will remain a hallucination if the schools

remain devoid of special educators. The technology is ready, and the economics supports the shift. The remaining barrier is the human infrastructure. The "zero special educators for CVI" finding is an indictment of the current system and a call to action. By moving from a welfare-based, CAPEX-heavy model to an education-centric, service-based model, and by treating the recruitment of special educators as an emergency, India can dismantle the "disability poverty trap" for the next generation. Technology is not a luxury for the blind. It is the infrastructure of their liberation. But without the teachers to unlock its potential, it is merely expensive hardware. The cost of inaction will result in a generation lost to illiteracy and dependency. It is a price no society can afford to pay.

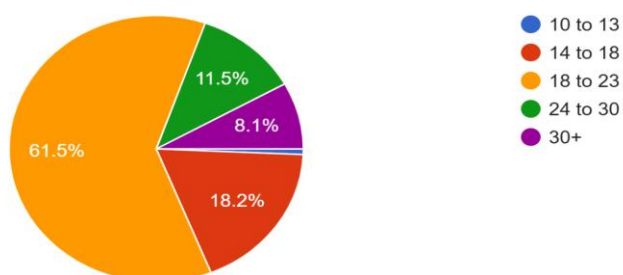
Appendix 1

Questionnaire and responses (N=148)

1. Age group (in years)

- a) 10 to 13
- b) 14 to 18
- c) 18 to 23
- d) 24 to 30
- e) 30+

Age group (in years)
148 responses



2. When you imagine a visually impaired student studying, what image comes to your mind first?

- a) A student listening to audio/recordings.
- b) A student reading a thick physical Braille book with their fingers.
- c) A student using a laptop or digital tablet.
- d) I have never seen a visually impaired student studying.

When you imagine a visually impaired student studying, what image comes to your mind first?
148 responses

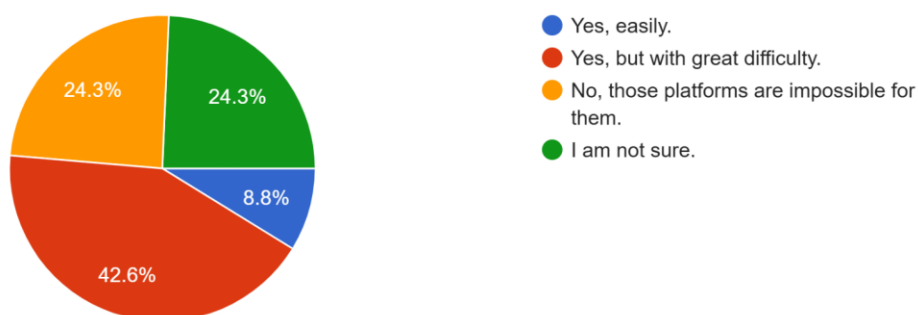


3. To the best of your knowledge, can a visually impaired person currently use "visual" platforms like Instagram, LinkedIn, or WhatsApp effectively?

- a) Yes, easily.
- b) Yes, but with great difficulty.
- c) No, those platforms are impossible for them.
- d) I am not sure.

To the best of your knowledge, can a visually impaired person currently use "visual" platforms like Instagram, LinkedIn, or WhatsApp effectively?

148 responses



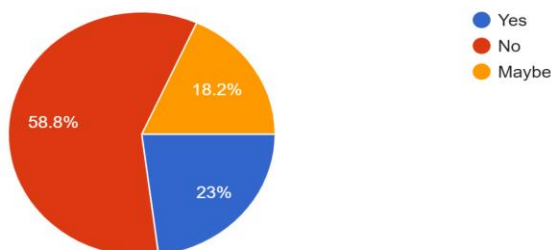
4. Did you know this?

Providing physical Braille books for one student costs INR 15,000+ per year (recurring). A digital Braille Tablet costs INR 50,000 (one-time) and lasts 5 years or more.

- a) Yes
- b) No
- c) Maybe

Did you know this?

148 responses

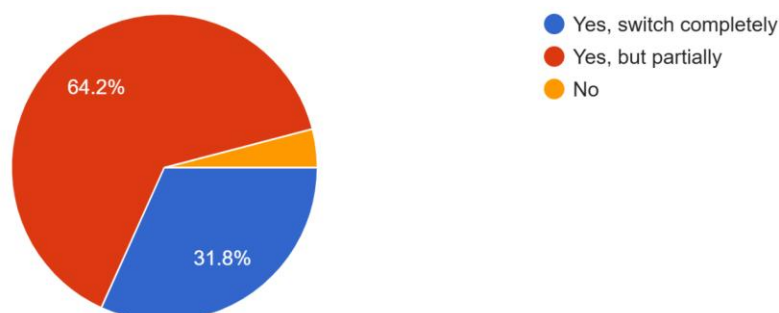


5. Should the government switch to digital tablets?

- a) Yes, switch completely
- b) Yes, but partially
- c) No

Should the government switch to digital tablets?

148 responses

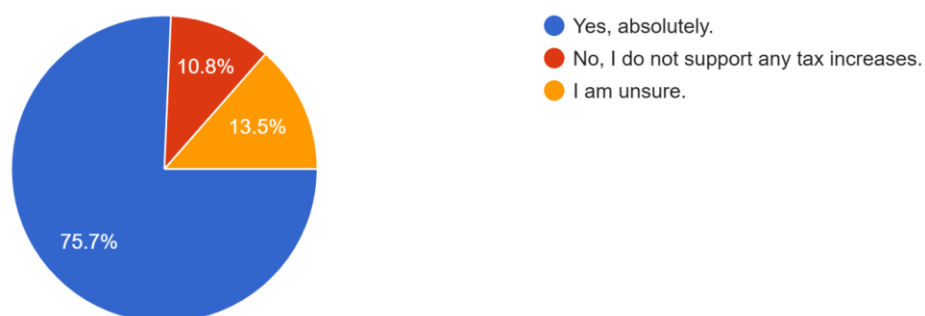


6. If ensuring a blind child gets a digital future cost you personally the equivalent of one cup of coffee per year (INR 50) via taxes, would you support it?

- a) Yes, absolutely.
- b) No, I do not support any tax increases.
- c) I am unsure.

If ensuring a blind child gets a digital future cost you personally the equivalent of one cup of coffee per year (INR 50) via taxes, would you support it?

148 responses

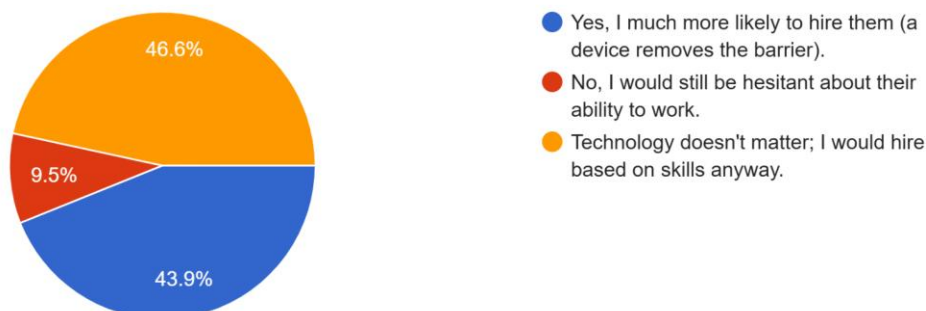


7. Would you hire a visually impaired candidate if they own a laptop and are as skilled as anyone else?

- a) Yes, I much more likely to hire them (a device removes the barrier).
- b) No, I would still be hesitant about their ability to work.
- c) Technology doesn't matter; I would hire based on skills anyway.

Would you hire a visually impaired candidate if they own a laptop and are as skilled as anyone else?

148 responses

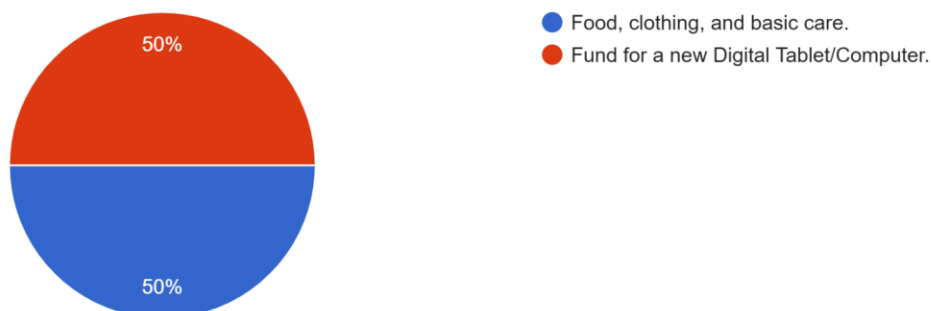


8. If you had INR 1,000 to donate to a blind school today, which sector would you prefer your money goes?

- a) Food, clothing, and basic care.
- b) Fund for a new Digital Tablet/Computer.

If you had INR 1,000 to donate to a blind school today, which sector would you prefer your money goes?

148 responses



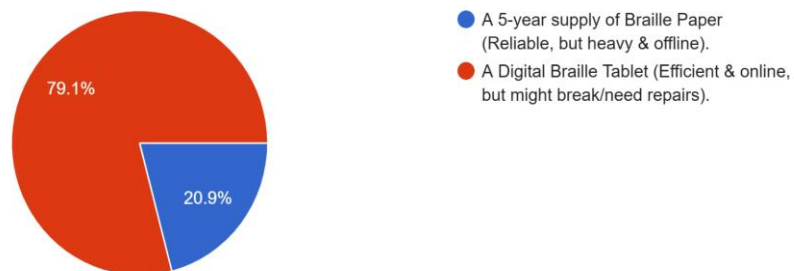
9. Which one should be the priority for a visually impaired student?

- a) A 5-year supply of Braille Paper (Reliable, but heavy & offline).

b) A Digital Braille Tablet (Efficient & online, but might break/need repairs).

Which one should be the priority for a visually impaired student?

148 responses



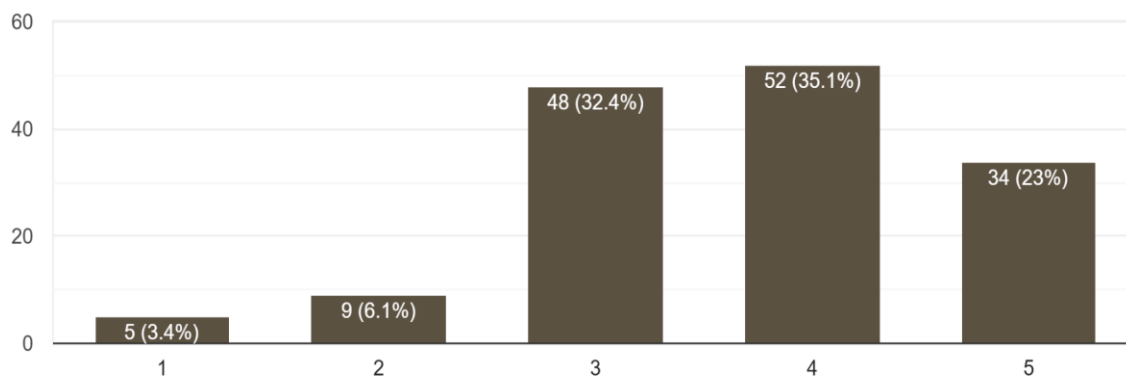
Please rate the following statements on a scale of 1 to 5.

(1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree)

10. I believe a visually impaired person can work just as fast as me if they have the right computer.

I believe a visually impaired person can work just as fast as me if they have the right computer.

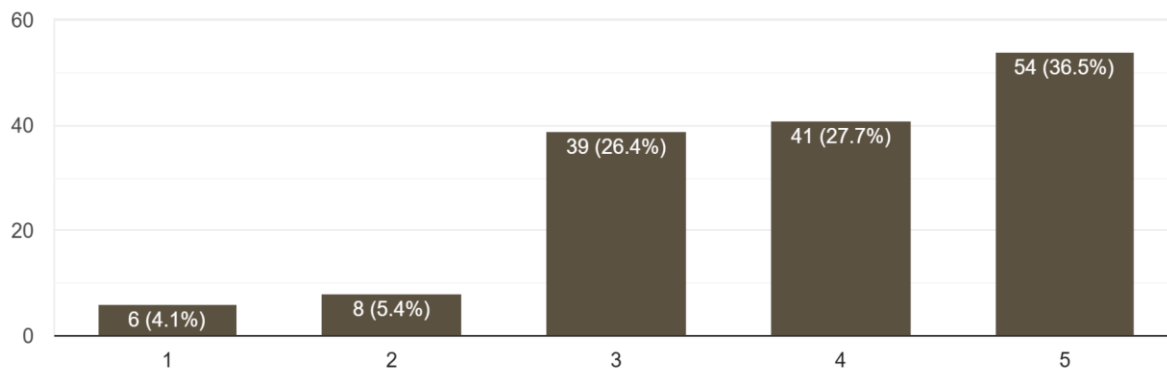
148 responses



11. It is the government's responsibility to provide Braille Tablets to disabled students, even if it is expensive.

It is the government's responsibility to provide Braille Tablets to disabled students, even if it is expensive.

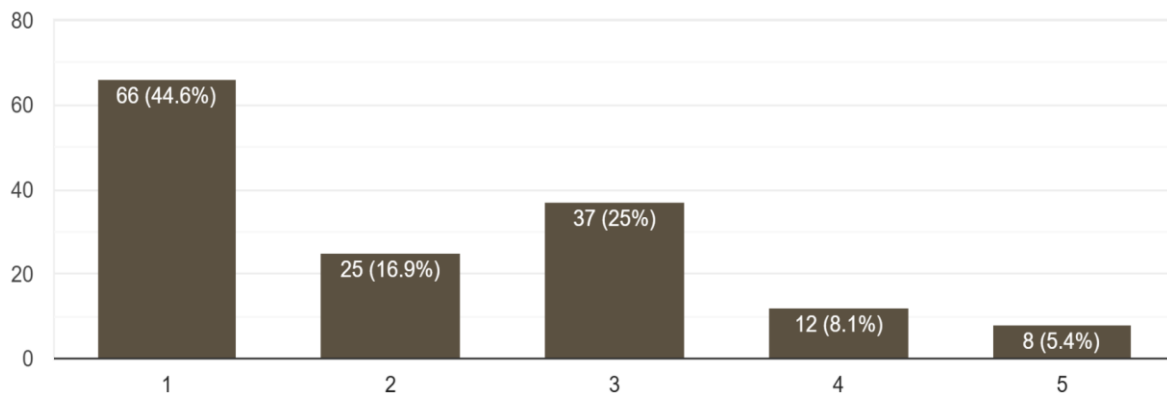
148 responses



12. Interacting with a visually impaired person on social media feels awkward.

Interacting with a visually impaired person on social media feels awkward.

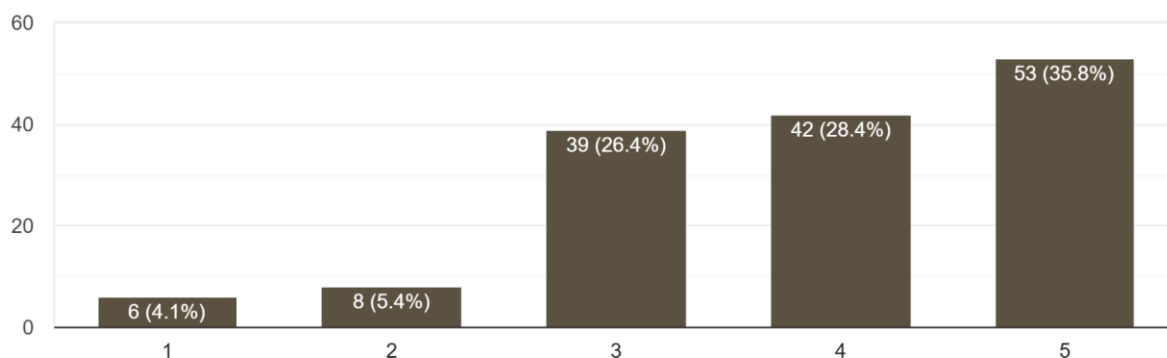
148 responses



13. Braille tablets are a better investment than physical Braille books.

Braille tablets are a better investment than physical Braille books.

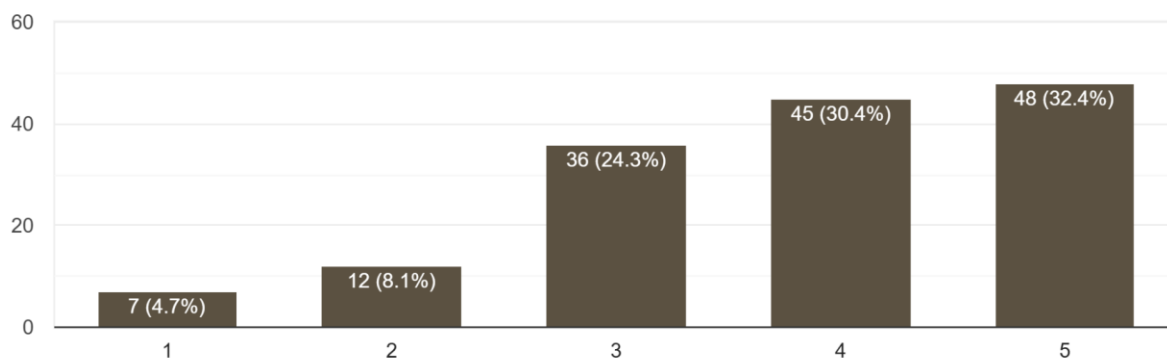
148 responses



14. Private companies (CSR) should fund Braille tablets rather than using taxpayer money.

Private companies (CSR) should fund Braille tablets rather than using taxpayer money.

148 responses



15. Rank the following barriers to education for the visually impaired from 1 (Biggest Problem) to 4 (Smallest Problem). [Multiple Choice Grid Question]

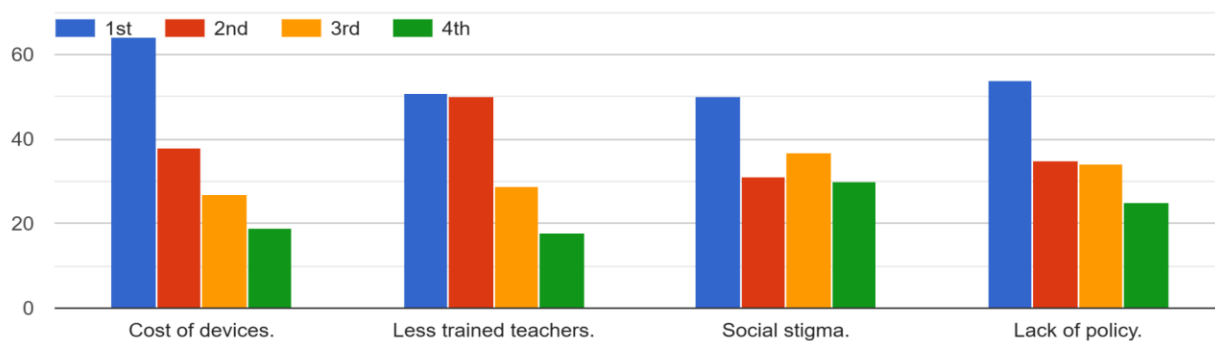
Cost of devices.

Less trained teachers.

Social stigma.

Lack of policy

Rank the following barriers to education for the visually impaired from 1 (Biggest Problem) to 4 (Smallest Problem).



16. Do you think how tech can help the visually impaired? [70 responses - Optional Question]

References

- CSRBOX. (2024). *Annie-Self Learning Braille Device* [Webpage]. CSRBOX.
https://csrbox.org/India_CSR_products_Annie-Self-Learning-Braille-Device_152
- Dalal, Ajit. (2010). Disability-poverty nexus: Psycho-social impediments to participatory development. *Psychology and Developing Societies*, 22, 409-437.
<https://doi.org/10.1177/097133361002200208>
- Department of Empowerment of Persons with Disabilities (DEPwD). (2022). *Scheme of Assistance to Disabled Persons for Purchase/Fitting of Aids/Appliances (ADIP)*. Ministry of Social Justice and Empowerment, Government of India. <https://depwd.gov.in/en/adip/>
- Department of School Education and Literacy. (2025, June 27). *State/UTs-wise enrolment of children with special needs (CWSN) by gender and level of school education during 2023-24* [Data set]. Open Government Data (OGD) Platform India.
<https://www.data.gov.in/resource/stateuts-wise-enrolment-children-special-needs-cwsn-gender-and-level-school-education>
- Fitas, R. (2025, September). Inclusive education with AI: Supporting special needs and tackling language barriers. *AI and Ethics*, 5(6), 5729-5757. <https://doi.org/10.1007/s43681-025-00824-3>
- Jose, D. (2024, January 5). *State schools lack special educators*. Times of India.
<https://timesofindia.indiatimes.com/india/state-schools-lack-special-educators/articleshow/106553542.cms>
- Mannava, S., Borah, R. R., & Shamanna, B. R. (2022). Current estimates of the economic burden of blindness and visual impairment in India: A cost of illness study. *Indian Journal of Ophthalmology*, 70(6), 2141–2145. https://doi.org/10.4103/ijo.IJO_2804_21

- Ministry of Education (MoE). (2025, August 13). *Nation-wide week-long mega assessment and distribution camps for Children with Special Needs (CwSN) conducted under Samagra Shiksha to commemorate 5 Years of NEP 2020* [Press Release]. Press Information Bureau (PIB). <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2156137®=3&lang=2>
- Ministry of Human Resource Development (MHRD). (2020). *National Education Policy 2020*. Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Ministry of Law and Justice. (2016). *The Rights of Persons with Disabilities Act, 2016*. Government of India.
- Mitra, S. (2006, March). The Capability approach and disability. *Journal of Disability Policy Studies*, 16(4), 236-247. <https://doi.org/10.1177/10442073060160040501>
- Mitra, S., & Sambamoorthi, U. (2006, January). Employment of persons with disabilities: Evidence from the National Sample Survey. *Economic and Political Weekly*, 41(3), 199-203. <https://doi.org/10.2307/4417696>
- Orbit Research. (2024). *Orbit Reader 20*. <https://www.orbitresearch.com/product/orbit-reader-20/>
- PTI. (2024, March 1). *Telangana govt issues notification for recruitment of over 11,000 teachers*. [The Economic Times](https://education.economictimes.indiatimes.com/news/industry/telangana-govt-issues-notification-for-recruitment-of-over-11000-teachers/108121832). <https://education.economictimes.indiatimes.com/news/industry/telangana-govt-issues-notification-for-recruitment-of-over-11000-teachers/108121832>
- Rajneesh Kumar Pandey & Ors. v. Union of India & Ors., 5 S.C.R. 1142 (2021). <https://cdnbbsr.s3waas.gov.in/s3d04863f100d59b3eb688a11f95b0ae60/uploads/2025/06/202506171297690763.pdf>

Reid, C. (2017, May 18). *Ending the book famine: The Marrakesh Treaty*. International Agency for the Prevention of Blindness (IAPB). <https://www.iapb.org/news/ending-the-book-famine-the-marrakesh-treaty/>

Wadhawan, A. (2023, January 25). *Schools will soon have to appoint special educators for differently-abled students*. The Times of India. <https://timesofindia.indiatimes.com/education/news/schools-will-soon-have-to-appoint-special-educators-for-differently-abled-students/articleshow/97316488.cms>