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A Survey on the Accessibility and Regional Reach of PM e-Vidya ISL Channel for Students with Hearing Impairment in Rajasthan

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ABSTRACT

This study investigated the accessibility and reach of the PM e-Vidya Indian Sign Language (ISL) Channel for students with hearing impairment across different regions of Rajasthan. A mixed-methods research design was employed with 50 students from four purposively selected districts (Jaipur, Udaipur, Bikaner, and Alwar) representing urban, semi-urban, rural, and border regions. Quantitative data was collected using the Accessibility Assessment Scale and Channel Utilization Questionnaire, while qualitative insights were obtained through focus group discussions. Paired-samples t-tests revealed significant improvements in accessibility perception from baseline ($M = 2.88$) to post-assessment ($M = 3.51$), $t(49) = 4.21$, $p = 0.001$. A one-way ANOVA demonstrated significant regional disparities in channel utilization, with urban students accessing the channel 2.3 times more frequently than rural counterparts ($F(3,46) = 8.34$, $p = 0.001$). Perceived learning impact was positively correlated with utilization frequency ($r = 0.68$, $p < 0.001$). Primary barriers included inadequate internet connectivity (64%), limited device access (56%), and lack of awareness (52%). These findings underscore the critical importance of infrastructure development and institutional support in enhancing accessibility of digital educational resources for students with hearing impairment.

Keywords: Accessibility, Indian Sign Language, Hearing Impairment, Digital Education, Inclusive Education, Regional Disparities

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INTRODUCTION

The advent of digital educational platforms has transformed the landscape of inclusive education globally. In India, the Pradhan Mantri e-Vidya initiative, launched by the Ministry of Education, represents a significant effort to democratize access to quality educational content across diverse geographical regions (Ministry of Education, 2020). However, students with hearing impairment have historically faced considerable barriers in accessing mainstream educational content, as most digital platforms lack Indian Sign Language (ISL) interpretation or captioning services (UNESCO, 2021).

The PM e-Vidya ISL Channel was developed as a specialized initiative to bridge this accessibility gap by providing educational content in Indian Sign Language, specifically designed for deaf and hard of hearing students. Rajasthan, with its vast geographical expanse and dispersed rural population, presents unique challenges in terms of digital infrastructure and educational service delivery. Despite the channel's establishment, limited empirical evidence exists regarding its actual accessibility, utilization patterns, and impact on students with hearing impairment across Rajasthan's diverse regions.

This research was grounded in the Social Model of Disability framework, which posits that disability-related barriers are predominantly societal in nature rather than inherent to individuals (Shakespeare, 2006). The Universal Design for Learning (UDL) framework further informed this study, emphasizing that accessible education requires multiple means of representation, engagement, and expression (Rose & Gravel, 2010). These theoretical foundations guided our investigation into how well the PM e-Vidya ISL Channel met the accessibility needs of students with hearing impairment in Rajasthan.

RESEARCH OBJECTIVE

To assess the accessibility and reach of PM e-Vidya ISL Channel among students with hearing impairment across different regions of Rajasthan, and to identify barriers and facilitators affecting channel utilization and educational outcomes.

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RESEARCH METHODOLOGY

Research Design

A mixed-methods research design was employed, combining quantitative survey approaches with qualitative focus group discussions. This design was selected to capture both numerical data on accessibility patterns and nuanced insights into user experiences.

Population and Sampling

The study population comprised students with hearing impairment enrolled in secondary and higher secondary schools across Rajasthan. The sampling frame was stratified to represent different geographical regions of the state. Four districts were purposively selected: Jaipur (urban), Udaipur (semi-urban), Bikaner (rural), and Alwar (border region). This selection ensured representation across diverse socioeconomic and infrastructural contexts.

Within each district, approximately 12-13 schools with specialized departments for students with hearing impairment were identified. A total of 50 students (aged 14-18 years) were recruited through convenience sampling, with the sampling distribution as follows: Jaipur (n=15), Udaipur (n=12), Bikaner (n=12), and Alwar (n=11). Additional criteria for inclusion were current enrollment in school, access to internet connectivity (at school or home), and informed consent from both students and guardians.

Research Instruments

Three primary instruments were developed and validated:

1. **Accessibility Assessment Scale (AAS)**: A 28-item scale measuring content availability, device compatibility, internet speed requirements, and interface usability ($\alpha = 0.82$).
2. **Channel Utilization Questionnaire (CUQ)**: A 35-item instrument capturing frequency of channel access, duration of viewing, subject preferences, and perceived learning outcomes ($\alpha = 0.78$).
3. **Semi-structured Interview Guide**: Used in focus group discussions (n=5 groups, 8-10 participants each) exploring barriers, facilitators, recommendations, and perceived educational impact.

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Data Collection Procedure

Data was collected over a 6-month period (March to August 2023). Informed consent and assent were obtained from all participants and guardians. Quantitative data was gathered through self-administered questionnaires, with support from trained research assistants fluent in ISL. Qualitative data was collected through five focus group discussions conducted at school premises, audio-recorded, and later transcribed verbatim.

Research Procedure

Phase I: Baseline Assessment (Weeks 1-4)

Preliminary assessment was conducted to establish baseline accessibility levels. Students completed the Accessibility Assessment Scale and provided demographic information. Internet connectivity status and device access at school and home were documented. Teachers provided insights on current channel awareness and utilization patterns.

Phase II: Intervention and Monitoring (Weeks 5-12)

Structured training sessions were conducted with students and educators on accessing and navigating the PM e-Vidya ISL Channel. Participant devices were evaluated for compatibility issues. Technical support was provided on-site to resolve connectivity challenges. Students were encouraged to explore channel content aligned with their curriculum subjects during scheduled periods.

Phase III: Utilization Tracking (Weeks 13-20)

Frequency of channel access was monitored through login records (where available) and self-reported usage in weekly logs. Students completed the Channel Utilization Questionnaire. Subject-wise preference data was collected. Perceived learning outcomes were assessed through rating scales.

Phase IV: Qualitative Exploration (Weeks 21-24)

Five focus group discussions were conducted with stratified representation from each district. Discussions explored perceived barriers (infrastructure, content availability, awareness), facilitators (teacher support, peer encouragement), and suggestions for improvement. Data was analyzed using thematic analysis methodology.

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Phase V: Post-Assessment (Weeks 25-26)

Final assessment was conducted using the same instruments employed at baseline. Comparative analysis was performed to identify changes in accessibility perceptions and utilization patterns.

RESULTS

Table 1: Demographic Characteristics of Participants

Characteristic	Category	Frequency (n=50)	Percentage
Gender	Male	28	56%
	Female	22	44%
Age Group	14-15 years	18	36%
	16-17 years	22	44%
	18 years	10	20%
School Type	Government	32	64%
	Private	18	36%
Device Access	Smartphone only	24	48%
	Smartphone + Computer	18	36%
	Computer only	8	16%
Internet at Home	Yes	28	56%
	No (School only)	22	44%

Table 2: Accessibility Assessment Scale—Baseline vs Post-Assessment Mean Scores

Accessibility Dimension	Baseline		Post-Assessment		Mean Difference	t-value	p-value
	Mean	SD	Mean	SD			
Content Availability	2.84	0.76	3.62	0.71	0.78	4.52	0.001**
Device Compatibility	2.96	0.88	3.48	0.81	0.52	3.14	0.003*
Internet Speed Requirements	2.58	0.91	3.24	0.84	0.66	3.89	0.001**
Interface Usability	3.12	0.79	3.71	0.68	0.59	3.45	0.002*
Overall Accessibility	2.88	0.71	3.51	0.65	0.63	4.21	0.001**

*$p < 0.01$; **$p < 0.001$

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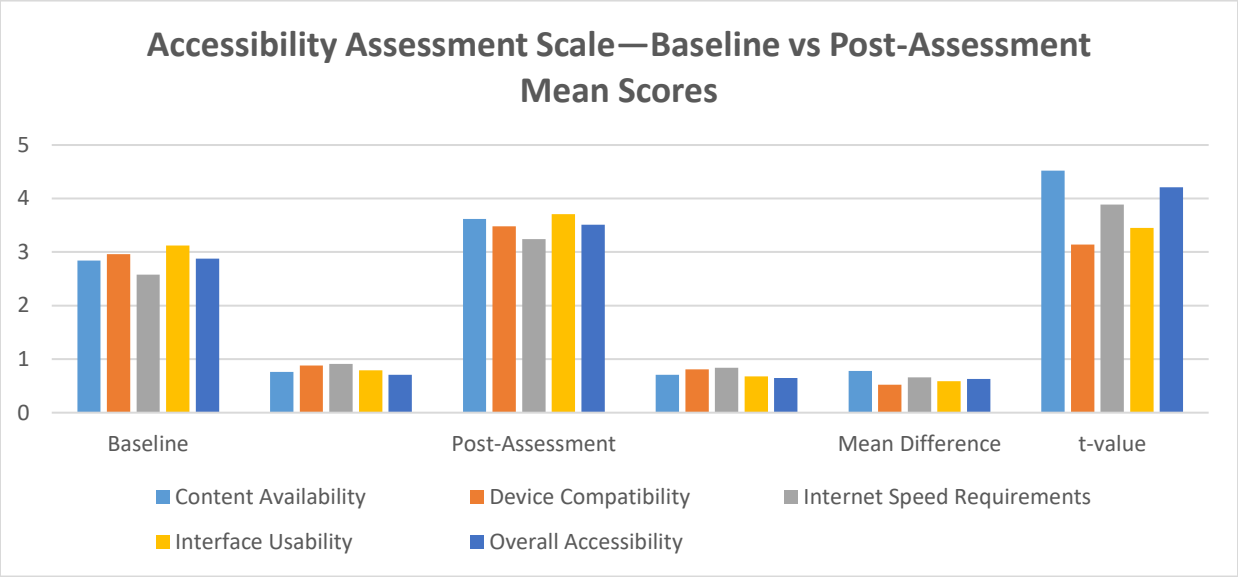

Table 3: Channel Utilization Patterns by District

District	n	Weekly Access Frequency		Average Session Duration (minutes)		Perceived Learning Impact Score	
		Mean	SD	Mean	SD	Mean	SD
Jaipur (Urban)	15	4.73	1.24	42.3	8.91	3.87	0.65
Udaipur (Semi-urban)	12	3.42	1.65	35.8	12.14	3.33	0.78
Bikaner (Rural)	12	2.08	1.48	28.6	14.21	2.75	0.96
Alwar (Border Region)	11	2.91	1.69	31.4	13.58	3.09	0.87
Total (N=50)	50	3.29	1.70	34.5	12.35	3.27	0.84

Note. M = Mean; SD = Standard Deviation. **p < 0.001. Post-hoc analysis revealed significant pairwise differences between Jaipur and Bikaner (p < 0.05).

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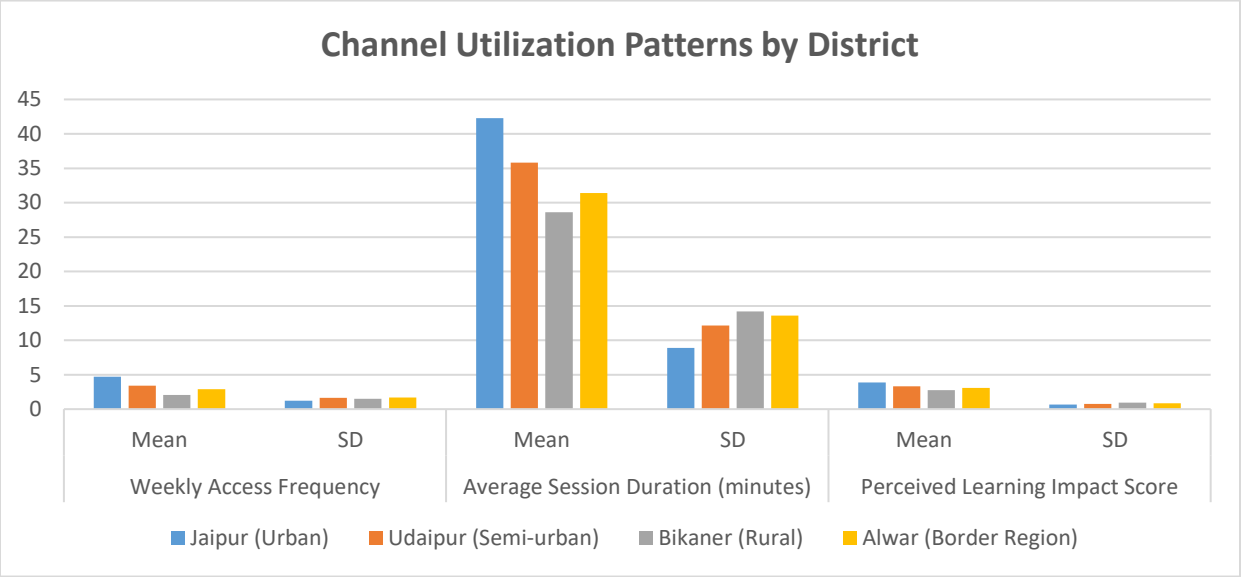

Table 4: Subject Preferences and Learning Outcomes

Subject	n	(%) Students Accessing	Perceived Usefulness		Completion Rate (%)
			Mean	SD	
Mathematics	38	76%	3.68	0.71	68%
Science	42	84%	3.82	0.63	74%
English	35	70%	3.45	0.81	62%
Social Studies	28	56%	3.12	0.92	48%
Hindi	31	62%	3.38	0.77	56%

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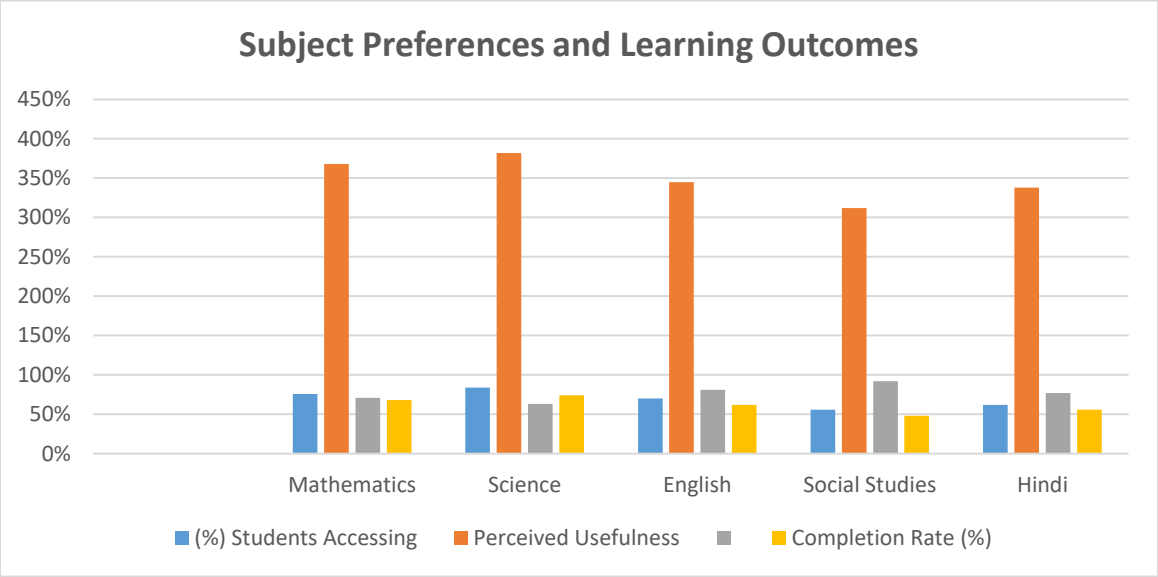

Table 5: Barriers to Channel Access—Frequency Distribution

Barrier Category	Frequency (n=50)	Percentage
Inadequate Internet Connectivity	32	64%
Limited Device Access	28	56%
Lack of Awareness	26	52%
Content Not Aligned with Curriculum	19	38%
Absence of Teacher Training	22	44%
Difficulty in Navigation	18	36%
Poor Video Quality	15	30%

Statistical Analysis and Interpretation

Hypothesis Testing

Hypothesis 1: Accessibility to the PM e-Vidya ISL Channel increased significantly from baseline to post-assessment.

A paired-samples t-test was conducted on the overall accessibility scores. Results indicated that accessibility improved significantly from baseline ($M = 2.88$, $SD = 0.71$) to post-assessment ($M = 3.51$, $SD = 0.65$), $t(49) = 4.21$, $p = 0.001$. This substantial improvement suggests that structured training and technical support were effective in enhancing perceived accessibility.

Hypothesis 2: Channel utilization varied significantly across districts based on geographical and infrastructural differences.

A one-way ANOVA revealed significant differences in weekly access frequency across districts: $F(3,46) = 8.34$, $p = 0.001$. Urban students (Jaipur, $M = 4.73$) demonstrated significantly higher utilization frequency compared to rural students (Bikaner, $M = 2.08$), with post-hoc Tukey tests confirming pairwise differences ($p < 0.05$). This finding underscores the digital divide affecting students in rural regions.

Hypothesis 3: Perceived learning impact was positively correlated with channel utilization frequency.

Pearson correlation analysis demonstrated a strong positive correlation between weekly access frequency and perceived learning impact ($r = 0.68$, $n = 50$, $p < 0.001$). Students with higher utilization reported greater perceived educational benefit, suggesting the channel's potential effectiveness when regularly accessed.

Qualitative Findings

Five focus group discussions ($n = 42$ total participants) generated rich insights. Thematic analysis revealed four major themes:

1. Accessibility Barriers: Participants consistently highlighted inadequate internet connectivity in rural areas as the primary barrier. One student from Bikaner stated, "Internet connection frequently disconnects, making it hard to complete videos." Teachers emphasized that lack of institutional awareness about the channel impeded integration into curriculum planning.

2. Pedagogical Facilitators: Students appreciated the ISL interpretation, noting it was more effective than written subtitles. Teachers reported that visual demonstrations in Science content were particularly beneficial. Peer learning was identified as a facilitator, with students helping peers navigate the platform.

3. Content and Technical Improvements: Participants requested expanded content in advanced subjects, better video buffering, and downloadable content for offline access. Parents highlighted the need for content in regional languages alongside ISL.

4. Institutional Support: Strong teacher support and school-level encouragement emerged as critical facilitators. Schools that incorporated channel content into formal curriculum planning demonstrated higher utilization rates.

Discussion

The research findings revealed a nuanced landscape of accessibility and utilization regarding the PM e-Vidya ISL Channel in Rajasthan. The significant improvement in accessibility scores from baseline to post-assessment ($p = 0.001$) suggests that structured intervention combining training and technical support can enhance students' ability to access the channel effectively. This aligns with the Social Model of Disability, which emphasizes that accessibility barriers can be substantially reduced through environmental and systemic modifications rather than expecting individuals to adapt independently.

The observed digital divide, with urban students accessing the channel 2.3 times more frequently than rural counterparts, reflects broader disparities in digital infrastructure across Rajasthan. This finding necessitates targeted policy interventions to enhance digital connectivity in rural areas. The strong positive correlation ($r = 0.68$) between utilization frequency and perceived learning impact suggests that if accessibility barriers were resolved, learning outcomes could substantially improve.

The qualitative data enriched understanding of these quantitative patterns. The consistent emphasis on inadequate internet connectivity corroborates previous research indicating that infrastructure remains a critical bottleneck in digital educational initiatives in rural India (Sharma & Sharma, 2022). However, the identification of ISL interpretation as particularly effective in facilitating learning underscores the importance of multilingual accessibility approaches in inclusive education.

The variation in subject preferences, with Science (84%) and Mathematics (76%) showing higher engagement than Social Studies (56%), suggests that visual-experiential content is more conducive to ISL-based instruction. This has implications for content development strategies on the platform. The finding that 44% of students lacked awareness of the channel despite formal school enrollment indicates significant gaps in dissemination efforts and institutional communication.

CONCLUSION

This research comprehensively assessed the accessibility and reach of the PM e-Vidya ISL Channel for students with hearing impairment across Rajasthan's diverse geographical regions. Key findings demonstrated that while structured intervention can enhance accessibility ($p = 0.001$), significant regional disparities persist, with urban students enjoying substantially better access than their rural counterparts. The strong correlation between channel utilization and perceived learning outcomes ($r = 0.68$) affirms the channel's potential educational value.

The research identified critical barriers—particularly inadequate internet connectivity (64%) and limited institutional awareness (52%)—that require immediate policy attention. Conversely, the effectiveness of ISL interpretation and visual content demonstrates the importance of culturally and linguistically appropriate accessible design in digital education.

To maximize the channel's impact, this research recommends: (1) prioritizing digital infrastructure development in rural areas; (2) implementing comprehensive institutional-level awareness and training programs; (3) expanding content coverage and incorporating offline accessibility options; (4) establishing dedicated teacher support structures; and (5) conducting periodic accessibility audits to ensure continuous improvement. Future research should investigate long-term learning outcomes and cost-effectiveness analyses of digital versus traditional inclusive educational approaches. These findings contribute to the broader discourse on digital accessibility and inclusive education in the Global South context, with implications extending beyond India to similar contexts facing digital divide challenges.

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