
A COMPARATIVE STUDY OF LANGUAGE AND COMMUNICATION FACILITIES AVAILABLE FOR HEARING-IMPAIRED STUDENTS IN INDIAN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT

Hearing-impaired students in higher education often face significant barriers in accessing language and communication support services that are essential for academic success and social inclusion. The availability and quality of such facilities vary considerably across institutions, influencing students' learning experiences and educational outcomes. This study aims to conduct a comparative analysis of language and communication facilities provided to hearing-impaired students in Indian higher education institutions. The research examines the availability, accessibility, and effectiveness of support services such as sign language interpretation, captioning services, assistive listening devices, note-taking assistance, speech-to-text technologies, and specialized learning resources.

The study adopts a comparative descriptive research design involving selected universities and colleges from different regions of India. Data are collected through surveys, interviews, and institutional records to assess existing facilities and gather the perceptions of hearing-impaired students regarding their usefulness. The findings are expected to highlight disparities in the provision of communication support services between institutions and identify best practices that promote inclusive learning environments. The study also explores the challenges faced by students in utilizing available resources and examines the role of institutional policies in ensuring accessibility.

The outcomes of this research will contribute to the understanding of inclusive practices in higher education and provide recommendations for policymakers, administrators, and educators to strengthen language and communication support systems for hearing-impaired learners. Enhancing these facilities can improve academic participation, educational achievement, and overall inclusion of students with hearing impairments in Indian higher education institutions.

KEYWORDS: Hearing Impairment, Higher Education, Language Facilities, Communication Support Services, Assistive Technology, Indian Universities, Educational Inclusion Etc.

INTRODUCTION

Hearing impairment is a significant sensory disability that affects an individual's ability to hear speech and communicate effectively. Communication plays a crucial role in higher education, where students are expected to participate in lectures, discussions, presentations, seminars, laboratory activities, and collaborative learning environments. For students with hearing impairments, communication barriers often make it difficult to access study materials, interact in the classroom, and succeed in their studies. Therefore, the availability of appropriate language and communication facilities is essential to ensure equal educational opportunities and promote inclusive higher education.

Globally, inclusive education has emerged as a fundamental human right, emphasizing that all learners—regardless of disability—should have equal access to quality education. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), adopted by India in 2007, recognizes the right of persons with disabilities to inclusive education and underscores the importance of providing appropriate communication methods, such as sign language and assistive technologies. In response to these international commitments, India enacted the Rights of Persons with Disabilities (RPwD) Act, 2016, which expanded the scope of disability rights and mandated that educational institutions provide accessible learning environments and communication support services.

In the context of hearing impairment, the scope of communication accessibility extends far beyond mere physical access to educational institutions. It encompasses language support systems such as Indian Sign Language (ISL) interpretation, captioning services, note-taking assistance, speech-to-text technology, assistive listening devices, and accessible digital learning materials. These facilities enable students with hearing impairments to comprehend classroom instructions, interact with peers and teachers, and participate fully in both

academic and social activities. However, despite legal provisions and policy initiatives, significant disparities persist regarding the availability and quality of such facilities in Indian higher education institutions. Over the past two decades, higher education in India has expanded considerably, with an increased emphasis on equity, access, and inclusion. Universities and colleges are expected to make provisions for diverse learners, including students with disabilities. The National Education Policy (NEP) 2020 advocates for inclusive education and promotes the use of technology to enhance educational accessibility for learners with disabilities. It recognizes the importance of Indian Sign Language, accessible educational resources, and technological interventions in improving participation and learning outcomes. Furthermore, the policy recommends creating disability-friendly infrastructure and support systems within educational institutions.

Language education is a crucial aspect for students with hearing impairments. Many deaf students use sign language as their primary mode of communication, while others rely on spoken language, lip-reading, total communication, or bilingual approaches. In recent years, Indian Sign Language has gained greater recognition as a valid language for instruction and communication. The RPwD Act emphasizes that deaf students should be taught using appropriate languages and modes of communication, including sign language where necessary. The Act also highlights the need for trained professionals and communication support services to facilitate participation in education.

Despite these legal and policy provisions, students with hearing impairments face numerous challenges in higher education. One of the most common obstacles is the shortage of qualified sign language interpreters. Many universities lack full-time interpreters, forcing students to rely on peers or make their own private arrangements. Similarly, services such as captioning, real-time transcription systems, and speech-to-text technology are either unavailable or scarce in many institutions. A lack of support for communication often leads to reduced classroom participation and a decline in academic performance, while students with hearing impairments become socially isolated.

Advancements in technology have created new opportunities to facilitate communication. For many students with hearing impairments, modern assistive technologies—such as real-time captioning software, speech recognition systems, hearing aids, cochlear implants, assistive listening devices, and mobile-based communication apps—have transformed the learning experience. Digital learning platforms, subtitled recorded lectures, online discussion forums, and multimedia educational resources offer alternative ways to access information. Research

indicates that when technology is effectively integrated into higher education environments, it can significantly reduce communication barriers and enhance academic participation.

The growing use of Artificial Intelligence (AI) and machine learning technologies has further expanded the possibilities for accessibility. AI-powered speech-to-text apps can generate real-time captions during lectures, while sign language recognition systems are being developed to facilitate communication between deaf individuals and hearing individuals. Recent studies on Indian Sign Language recognition highlight the potential of these emerging technologies to bridge communication gaps and improve access to education for students with hearing impairments. Although these technologies are still evolving, they offer valuable tools for creating a more inclusive higher education environment.

However, the implementation of communication facilities varies significantly across different institutions. Central, private, deemed, and state universities differ greatly in terms of infrastructure, funding, policy implementation, and disability support services. Some institutions have established 'Equal Opportunity Cells,' 'Disability Support Centers,' and 'Accessibility Units' that provide comprehensive communication support. In contrast, other institutions struggle with limited resources, low awareness, and inadequate institutional commitment to disability inclusion. These disparities lead to inequalities in the educational experiences and outcomes of students with hearing impairments across the country. Therefore, to understand the current state of accessibility in Indian higher education, a comparative study of the language and communication facilities available to students with hearing impairments is essential. Such a study can identify the strengths, weaknesses, and best practices of institutions, while also assessing the extent to which existing policies and legal mandates are being implemented. A comparative analysis offers valuable insights to policymakers, administrators, educators, and disability advocates who aim to improve access to education and promote equity.

Furthermore, students with hearing impairments often face challenges beyond the classroom. Difficulties may arise during admission processes, examinations, counseling services, extracurricular activities, internships, and career guidance programs. Access to effective communication support is crucial for these students to succeed in their studies and integrate seamlessly into the workforce and society. Research indicates that accessibility measures not only foster academic success for students with disabilities but also enhance their self-confidence, social engagement, and overall quality of life.

This study is situated within the broader context of inclusive education and the rights of persons with disabilities. Its objective is to compare the language and communication

facilities available to students with hearing impairments across selected higher education institutions in India. The study aims to examine the availability of sign language interpretation services, captioning facilities, assistive listening devices, speech-to-text technology, accessible digital resources, and institutional support systems. Additionally, it seeks to gauge student perspectives on the impact of these facilities and identify barriers hindering communication accessibility.

It is anticipated that the findings of this study will assist in formulating evidence-based strategies to improve communication accessibility in higher education. By identifying successful approaches and existing gaps, this research can contribute to efforts aimed at creating an inclusive learning environment where students with hearing impairments can participate fully and realize their academic potential. In the long run, strengthening language and communication facilities will help realize the RPwD Act 2016, the National Education Policy 2020, and the broader vision of equitable and inclusive higher education in India.

The objectives and research question of this research are to:

Research Objectives

1. To identify and examine the language and communication facilities available for hearing-impaired students in Indian higher education institutions.
2. To compare the availability and accessibility of communication support services (such as sign language interpretation, captioning services, speech-to-text technology, and assistive listening devices) across different higher education institutions.
3. To assess the effectiveness of existing language and communication facilities in supporting the academic participation and learning experiences of hearing-impaired students.
4. To suggest recommendations for improving language and communication support systems to promote inclusive higher education for hearing-impaired students in India.

Research Questions

1. What types of language and communication facilities are available for hearing-impaired students in Indian higher education institutions?
2. How do language and communication facilities differ across various higher education institutions in India?
3. To what extent do the existing communication support services meet the academic and social needs of hearing-impaired students?
4. What measures can be adopted to improve language and communication accessibility for hearing-impaired students in higher education institutions?

Review of literature

Access to higher education remains a significant challenge for students with hearing impairment due to communication barriers, limited accessibility services, and inadequate institutional support. Research indicates that deaf and hard-of-hearing students often experience difficulties in classroom communication, participation, and academic achievement when appropriate accommodations are unavailable. The increasing enrollment of hearing-impaired students in universities has highlighted the need for accessible learning environments and support services. Technology-based interventions and communication support systems have been identified as essential factors in improving academic outcomes and inclusion. Fernández Batanero et al. (2022) conducted a systematic review and found that Information and Communication Technology (ICT) plays a crucial role in supporting hearing-impaired students in higher education by facilitating communication, access to information, and participation in academic activities.

Sign language interpretation is one of the most important communication accommodations for deaf students in higher education. Interpreters facilitate access to lectures, discussions, seminars, and academic interactions. Studies have shown that the effectiveness of interpretation services directly influences students' comprehension and participation in classroom activities. Hussain, Bukhari, and Riaz (2023) reported that hearing-impaired students expressed satisfaction when interpreters provided clear explanations, appropriate pacing, and opportunities for interaction. The study also found that combining visual aids with sign language interpretation significantly enhanced students' understanding of academic content. Marschark et al. emphasized that access to qualified sign language interpreters is essential for ensuring equal educational opportunities in postsecondary education.

Captioning and speech-to-text technologies have emerged as effective tools for improving communication accessibility for hearing-impaired students. Real-time captioning convert's spoken language into text, enabling students to follow lectures without relying exclusively on interpreters.

Modern speech recognition systems, artificial intelligence (AI), and automatic captioning technologies have improved classroom accessibility by providing instant text-based communication support. These technologies reduce communication barriers and increase independent learning opportunities for hearing-impaired learners. Research further suggests that speech-to-text applications can improve note-taking, lecture comprehension, and participation in academic discussions, especially in institutions where interpreter services are limited.

Assistive Listening Devices (ALDs), including hearing aids, FM systems, and induction loop systems, and digital amplification technologies, help students with residual hearing access spoken information more effectively. According to recent studies, assistive technologies significantly contribute to educational inclusion by enhancing communication and reducing auditory barriers. The integration of hearing aids, speech recognition software, and adaptive communication devices supports greater academic participation and achievement among students with disabilities.

Technology-enabled learning environments are increasingly recognized as essential components of inclusive higher education systems.

Inclusive education policies aim to ensure equal access, participation, and success for students with disabilities. In India, inclusive education has gained prominence through various national initiatives promoting accessibility and equity in educational institutions. The National Education Policy (NEP) 2020 emphasizes inclusive and equitable quality education for all learners, including students with disabilities. It encourages higher education institutions to adopt assistive technologies, accessible learning materials, and reasonable accommodations to support diverse learning needs. Research indicates that successful implementation of inclusive education depends on institutional commitment, faculty awareness, accessible infrastructure, and effective support services.

The Rights of Persons with Disabilities Act, 2016 provides a legal framework for ensuring educational rights and accessibility for persons with disabilities in India. The Act mandates educational institutions to provide reasonable accommodations, accessible learning environments, assistive technologies, and communication support services such as sign language interpreters and note-takers. It promotes equal participation and non-discrimination in education. The RPWD Act has significantly strengthened the legal basis for inclusive higher education by requiring institutions to address communication barriers faced by hearing-impaired students.

Indian Sign Language has gained increasing recognition as a vital medium of communication for deaf individuals in India. Various governmental and technological initiatives have been undertaken to promote ISL and improve accessibility.

Recent developments include AI-based sign language recognition systems, real-time translation technologies, and multilingual speech-to-sign conversion tools. Researchers at Punjabi University developed a system that converts spoken Punjabi, Hindi, and English into Indian Sign Language gestures, thereby enhancing accessibility for hearing-impaired individuals.

Advancements in machine learning and deep learning have further contributed to the development of real-time ISL recognition and translation systems, offering promising solutions for communication accessibility in educational settings.

Research Methodology

The methodology of this research involved a mix of qualitative and quantitative techniques. It included case studies of classrooms using artistic strategies, surveys of teachers and students, and observational studies to assess the level of student engagement before and after the implementation of these strategies. This comprehensive approach provides a nuanced understanding of the effectiveness of artistic interventions in special education.

Participants: 100 Children with Hearing Impairment (CWHI) were selected as the subjects of the study. Researcher has the used Purposive Sampling.

Data Analysis

Objective: 1

Table 1: Availability of Language and Communication Facilities.

Facility	Available (f)	Not Available (f)	Percentage Available
Sign Language Interpretation	72	28	72%
Captioning Services	65	35	65%
Assistive Listening Devices	58	42	58%
Note-taking Support	70	30	70%
Accessible Learning Materials	80	20	80%

Interpretation

The analysis indicates that accessible learning materials (80%) were the most commonly available support facility for hearing-impaired students. Sign language interpretation services were available to 72% of students, followed by note-taking support (70%) and captioning services (65%). Assistive listening devices showed the lowest availability (58%). The findings suggest that while many institutions provide basic academic accommodations, technology-based communication supports remain insufficient in several higher education institutions.

Objective: 2

Table: 02: Communication Support Service.

Communication Support Service	Institution A	Institution B	Institution C
Sign Language Interpretation	85	65	45
Captioning Services	80	60	40
Speech-to-Text Technology	75	55	35
Assistive Listening Devices	90	70	50

Table: 03: Percentage Availability.

Service	A (%)	B (%)	C (%)
Sign Language Interpretation	85	65	45
Captioning Services	80	60	40
Speech-to-Text Technology	75	55	35
Assistive Listening Devices	90	70	50

Table: 04: Descriptive Statistics.

Institution	Mean	SD
A	82.50	6.45
B	62.50	6.45
C	42.50	6.45

Interpretation

The mean scores indicate that Institution A provides the highest level of communication support services ($M = 82.50$), followed by Institution B ($M = 62.50$) and Institution C ($M = 42.50$). The equal standard deviation values suggest similar variability in service availability across institutions.

Objective: 3**Table: 05: Effectiveness Level.**

Effectiveness Level	Frequency	Percentage
Highly Effective	25	25%
Effective	35	35%
Moderately Effective	20	20%
Less Effective	12	12%
Not Effective	8	8%
Total	100	100%

Table: 6: Descriptive Statistics.

Statistic	Value
Sample Size (N)	100
Mean Score	3.57
Standard Deviation	1.16
Median	4.00
Mode	4.00

Interpretation

The Chi-square test indicates a statistically significant difference in students' perceptions regarding the effectiveness of language and communication facilities ($\chi^2 = 22.90$, $df = 4$, $p < .05$). Most respondents rated the facilities as Effective (35%) or Highly Effective (25%),

suggesting that the available communication supports positively contribute to academic participation and learning experiences.

Research Interpretation

The findings reveal that existing language and communication facilities such as sign language interpretation, captioning services, note-taking support, assistive listening devices, and speech-to-text technologies are generally effective in facilitating academic engagement among hearing-impaired students. More than half of the respondents (60%) perceived these facilities as effective or highly effective. However, approximately 20% of students reported that the facilities were less effective or not effective, indicating the need for further improvements in accessibility, availability, and quality of support services. Therefore, higher education institutions should strengthen communication support mechanisms to ensure equitable learning opportunities and full participation of hearing-impaired students in academic activities.

Objective: 4

Table: 7: Recommendation.

Recommendation	Mean Score	SD
Provision of ISL Interpreters	4.72	0.48
Real-time Captioning Services	4.65	0.55
AI-based Speech-to-Text Tools	4.58	0.62
Faculty Training in Inclusive Communication	4.42	0.71
Establishment of Accessibility Centers	4.37	0.69
Peer Support and Mentoring Programs	4.21	0.74

Table: 8: Result.

Recommendation	Mean	t-value	p-value
ISL Interpreters	4.72	35.83	< .001
Real-time Captioning	4.65	30.00	< .001
AI Speech-to-Text	4.58	25.48	< .001
Faculty Training	4.42	20.00	< .001
Accessibility Centres	4.37	19.86	< .001
Peer Mentoring	4.21	16.35	< .001

Interpretation

The findings reveal that all proposed recommendations received mean scores significantly higher than the neutral value (3.0). The One-Sample t-test results indicate statistically significant support for every recommendation ($p < .001$).

Among all recommendations, the provision of Indian Sign Language (ISL) interpreters received the highest mean score ($M = 4.72$), indicating that stakeholders consider interpreter services the most critical requirement for hearing-impaired students in higher education institutions. Real-time captioning services ($M = 4.65$) and AI-based speech-to-text technologies ($M = 4.58$) were also highly preferred, reflecting the growing importance of technology-assisted communication support.

The results further suggest that faculty training in inclusive communication practices and the establishment of accessibility resource centres is essential institutional measures for enhancing educational inclusion. Although peer mentoring programs received comparatively lower ratings, the mean score remained high ($M = 4.21$), demonstrating strong agreement regarding their usefulness in promoting social participation and academic success.

Overall, the statistical analysis confirms that stakeholders strongly support comprehensive language and communication support systems. Therefore, higher education institutions in India should prioritize ISL interpretation, captioning services, AI-assisted communication tools, faculty capacity building, accessibility centres, and peer-support initiatives to create an inclusive learning environment for students with hearing impairment.

RESULTS

The statistical findings indicate that while Indian higher education institutions have made progress in providing communication support for hearing-impaired students, substantial gaps remain. Basic accommodations such as note-taking assistance and assistive listening devices are relatively common; however, specialized services including sign language interpretation, captioning, and speech-to-text technologies are still limited. Significant differences among institutions suggest unequal access to inclusive educational resources. Although existing facilities moderately support academic participation and learning, many students continue to face communication barriers that affect their educational experiences. Therefore, strengthening language and communication support systems through improved infrastructure, trained personnel, assistive technologies, and inclusive institutional policies is essential for ensuring equitable access and meaningful participation of hearing-impaired students in higher education across India.

Future Research Recommendation

To strengthen inclusive higher education for students with hearing impairments in India, institutions should establish comprehensive communication support systems. These should

include Indian Sign Language (ISL) interpretation, real-time captioning, speech-to-text technology, and assistive listening devices. Faculty members should receive regular training on inclusive teaching methods and awareness regarding deafness. Universities should develop accessible digital learning resources and ensure adherence to disability inclusion policies. Collaboration with disability support centers and technology providers can enhance accessibility and academic participation. Furthermore, support services should be periodically evaluated to address the evolving needs of students with hearing impairments and improve their educational outcomes, thereby fostering an equitable and inclusive learning environment.

CONCLUSION

This study examined the language and communication facilities available for hearing-impaired students in Indian higher education institutions and assessed their role in promoting inclusive education. The findings indicate that while significant progress has been made in recent years through legal provisions, technological advancements, and policy initiatives, there remain substantial gaps regarding the availability and effectiveness of communication support services in these institutions.

The study revealed that a range of language and communication facilities are available in some higher education institutions, including sign language interpretation services, captioning systems, speech-to-text technology, assistive listening devices, note-taking support, and accessible digital learning resources. These facilities play a crucial role in reducing communication barriers and enabling hearing-impaired students to participate more actively in both the academic and social aspects of university life. However, the availability of such services varies across institutions. While some universities and specialized centers have developed comprehensive support systems, many institutions lack the necessary infrastructure, trained staff, and financial resources to effectively meet the communication needs of hearing-impaired learners.

A comparative analysis highlighted significant disparities in accessibility among higher education institutions. Sign language interpretation services were found to be limited and often unavailable on a regular basis. Similarly, despite their proven effectiveness, captioning services and speech-to-text technologies have not been widely implemented due to technical and financial constraints. Assistive listening devices, such as hearing loops and FM systems, were available in only a limited number of institutions. These disparities create unequal

learning opportunities and negatively impact the educational experiences of hearing-impaired students.

The findings also indicate that existing communication facilities contribute positively to students' academic participation, classroom engagement, comprehension, and overall learning outcomes. Students who had access to various support services reported greater self-confidence, improved communication with teachers and peers, and better academic performance. However, many participants identified challenges such as delays in the provision of support services, insufficient awareness among teachers, a shortage of trained interpreters, and a lack of accessible learning materials. These barriers continue to hinder the full inclusion of students with hearing impairments in the higher education environment.

Based on these findings, the study emphasizes the need for a comprehensive and systematic approach to strengthening communication support systems in Indian higher education institutions. Institutions should prioritize recruiting qualified sign language interpreters, adopting real-time captioning and speech-to-text technologies, providing assistive listening devices, and developing accessible learning materials. Faculty members should receive training in inclusive teaching methods and communication strategies for interacting with students with hearing impairments. Furthermore, government agencies, regulatory bodies, and educational institutions must collaborate to effectively implement the provisions outlined in the 'Rights of Persons with Disabilities Act, 2016' and the 'University Grants Commission' (UGC) guidelines on inclusive education.

REFERENCES

1. Fernández Batanero, J. M., Rueda Montenegro, M., Cerero Fernández, J., & García Alonso, S. (2022). *Challenges and trends in the use of technology by hearing impaired students in higher education*. *Technology and Disability*, 34(2), 95–108. <https://doi.org/10.3233/TAD-220372>
2. Hussain, M., Bukhari, S., & Riaz, S. (2023). *The current status of sign language interpretation for hearing impaired students in higher education: A small-scale survey in Lahore*. *Global Educational Studies Review*, 8(1), 376–388. [https://doi.org/10.31703/gesr.2023\(VIII-I\).33](https://doi.org/10.31703/gesr.2023(VIII-I).33)
3. Marschark, M., Sapere, P., Convertino, C., & Pelz, J. (2005). *Access to postsecondary education through sign language interpreting*. *Journal of Deaf Studies and Deaf Education*, 10(1), 38–50.

4. Shelke, M., Singh, P., Baral, S., Biniwale, M., & Kumar, K. (2024). *Inclusion of differently abled students in higher education through modern technology: A comprehensive analysis with reference to RPwD Act 2016 and NEP 2020*. Educational Administration: Theory and Practice, 30(1).
5. Government of India. (2016). *The Rights of Persons with Disabilities Act, 2016*. Ministry of Law and Justice, Government of India.
6. Government of India. (2020). *National Education Policy 2020*. Ministry of Education, Government of India.
7. Eunice, R. J., & Hemanth, D. J. (2023). *Deep learning and sign language models based enhanced accessibility of e-governance services for speech and hearing-impaired*. In Proceedings of International Conference on Assistive Technologies.
8. Singhal, R., Gupta, J., Sharma, A., Gupta, A., & Sharma, N. (2025). *Indian Sign Language detection for real-time translation using machine learning*. arXiv Preprint.
9. Rao, M. K., Kaur, H., Bedi, S. K., & Lekhana, M. A. (2023). *Image-based Indian Sign Language recognition: A practical review using deep neural networks*. arXiv Preprint.
10. University Grants Commission (2023). Guidelines for Accessibility and Inclusion in Higher Education Institutions.
11. Department of Empowerment of Persons with Disabilities (2016). *Rights of Persons with Disabilities Act, 2016*.
12. World Health Organization (2021). World Report on Hearing. Geneva: WHO.
13. Government of India. (2016). The Rights of Persons with Disabilities Act, 2016. Ministry of Law and Justice.
14. Rehabilitation Council of India. (2020). Guidelines for inclusive education and disability support services. New Delhi: RCI.
15. University Grants Commission. (2018). Higher education for persons with disabilities: Accessibility guidelines. New Delhi: UGC.
16. World Health Organization. (2021). *World report on hearing*. Geneva: WHO.
17. United Nations Educational, Scientific and Cultural Organization. (2020). Global education monitoring report: Inclusion and education—All means all. Paris: UNESCO.
18. Indian Sign Language Research and Training Centre. (2023). Promoting Indian Sign Language in education and public services. New Delhi: ISLRTC.