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Bridging the digital divide for school students with Specific Learning Disability in India: A Systematic Literature Review

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Abstract

This systematic literature review aims to investigate the educational materials now utilized in inclusive classrooms in India to close the digital divide for children with specific learning disabilities (SLD). With an emphasis on policy, assistive technology, and teacher preparedness, the goal is to assess how well these resources work to create inclusive learning environments and look at how they might be tailored to help different learners. The review followed PRISMA criteria and used a three-stage methodological approach of identification, screening, and eligibility. The ERIC, PubMed, and DOAJ databases were searched using Boolean operators and phrase searches using terms such as "SLD," "digital divide," and "assistive technologies." After initial identification, 150 publications underwent screening according to inclusion criteria, including open-access availability, peer-reviewed works published within the last ten years, an examination of digital divide issues in India, and a focus on SLD students. A final set of 36 research was chosen following screening and eligibility evaluations, and each study's quality was guaranteed using the MMAT tool. In order to use digital educational tools for equitable learning opportunities in Indian classrooms, the aggregated findings offer a thorough assessment of current methods and pinpoint gaps, challenges, and best practices.

Keywords: Learning disability, SLD, digital divide, literacy divide in India, specific learning disability, LD, assistive technology

INTRODUCTION

This systematic review paper aims to investigate what educational resources are currently being used in inclusive classrooms in India. It seeks to evaluate the efficacy of these tools in creating an environment for inclusive learning and look at how they are modified to assist various learners, including students with disabilities. In order to achieve inclusive education, the article will examine policies, assistive technologies, and teacher readiness. In order to better understand how educational resources might be maximized for equal learning opportunities in Indian classrooms, this study reviews the literature and case studies which are currently available to identify gaps, obstacles, and best practices.

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The phrase "digital divide" describes the inadequate incorporation of assistive technology-based learning materials in Indian classrooms, as used in this study. According to the Salamanca Statement, which highlights that "inclusive schools must recognize and respond to the diverse needs of their students", this disparity impedes the development of inclusive learning environments.

The absence of these tools makes it more difficult to accommodate and adapt to the needs of children with different learning requirements, which feeds into educational disparities. "Learning disabilities" refer to students who are diagnosed with particular difficulties in speaking, writing, and reading. By stating that "schools should accommodate all children regardless of their physical, intellectual, social, emotional, linguistic, or other conditions," the Salamanca Statement emphasizes how critical it is to address these issues (UNESCO,1994) (2022). [22,2023] The description goes well with the framework's need and requirement of inclusive education systems that meets the various requirements of all learners.

The research supports the Salamanca Statement's goal of inclusive education by operationalizing these definitions, guaranteeing that all students, irrespective of their disabilities or abilities, have fair access to high-quality digital educational opportunities.

Although inclusive education is promoted by the Salamanca Statement and Framework for Action on Special Needs Education, there are still a lot of unanswered questions about how to really apply it, especially in educational settings. Policies highlight the rights of students with disabilities, but practical obstacles prevent true inclusion that goes beyond physical integration (Singh,2023). There is a significant discrepancy in the way the technological digital divide is being addressed, wherein educational disparities are made worse by restricted access to digital resources. Students with disabilities are at a disadvantage since many schools, especially those with limited resources, lack sufficient assistive technology (Neeraja and Anuradha,2016). [16] Additionally, pupils are unable to fully participate in learning experiences due to the inaccessibility of assistive educational tools. Current research draws attention to broad accessibility problems without offering all-encompassing answers that are suited to various educational contexts. Furthermore, the difficulties faced by educators are commonly highlighted in contemporary writing. Furthermore, the difficulties educators face while putting inclusive strategies into practice are often the subject of recent literature. Therefore, more study is required to advance the idea of inclusion to actual educational equity.

Research Paradigm

A key component of inclusive education is the 1994 Salamanca Statement and Framework for Action on Special Needs Education, which promotes the idea that "all children should learn together, wherever possible, regardless of any difficulties or differences they may have." This framework promotes equitable access to high-quality education for all students by highlighting the need for educational systems to accommodate a range of learning demands. For kids with Specific Learning Disabilities (SLD) in India, closing the digital divide is essential. In order to promote digital literacy and improve learning outcomes, the National Education Policy 2020 emphasizes the significance of incorporating technology into the classroom. Nonetheless, there are still differences in access to digital resources, especially for students with SLD, which exacerbates educational inequality. To ensure that students with SLD can fully participate in the digital learning environment, addressing these issues calls for focused interventions, such as the development of inclusive digital material, teacher training, and assistive technology. These actions, which are in line with the Salamanca framework, are intended to establish an inclusive learning environment that meets the various requirements of every student.

Research Question

How can digital interventions bridge the accessibility gap for school students with Specific Learning Disabilities (SLD) in India?

Introduction to the Digital Divide

For students with Specific Learning Disabilities (SLD), the digital gap in India presents serious obstacles that restrict their access to high-quality education. The significance of closing this gap using assistive technologies and customized digital literacy programs has been emphasized by recent studies. In their evaluation of government programs to close the digital divide, Bansode and Patil (2021), for example, emphasized the necessity of access policies and infrastructure development in rural areas. [3] Kilaru (2023) also investigated the efficacy of digital literacy programs for kids with SLD, showing that they could improve learning results. [11]

Digital Literacy and Access Barriers

The importance of digital literacy in advancing inclusive education has been repeatedly demonstrated by research. Due to financial constraints and a lack of parental digital literacy, studies such as those conducted by Verma and Kumar (2021) [24] and Mishra et al. (2022) highlight the difficulties that students with disabilities encounter when trying to utilize digital resources. In addition, Badiuzzaman (2024) noted that parental computer literacy and affordability were important obstacles to digital inclusion. [2] As Nashipudi (2019) points out, using free educational resources offers a possible alternative by giving disadvantaged SLD students access to high-quality learning materials. [14] Furthermore, Mathrani et al. (2022) examined how the COVID-19 pandemic made already-existing digital disparities worse, highlighting the necessity of effective digital inclusion measures. [12]

Role of Assistive Technology

Assistive technology plays an important role for students with SLD, it is essential to improving their educational experiences. Neeraja and Anuradha (2016) [16] highlighted the value of assistive technology in raising student engagement and academic achievement. Jindal and Sahu (2020) went on to show how assistive technology and cell phones might improve learning outcomes in remote areas. [9] Singh et al. (2017) [21] offered long-term perspectives on the patterns and difficulties encountered by students with SLD, emphasizing the necessity of consistent interventions. Systemic deficiencies in the supply of assistive technology and teacher training were recognized by Ahuja (2021) as significant obstacles to inclusive education. [1]

Inclusive Education Frameworks

A framework for inclusive digital education was put forth by Nedungadi et al. (2018), with an emphasis on technology and legislative solutions to overcome access gaps. [17] According to Kumar et al. (2020), this framework supports the more general objective of improving digital inclusion for students with impairments. The potential of digital platforms in fostering accessibility was highlighted by Sharma et al.'s (2019) investigation into the use of technology to improve inclusive education in Indian schools. Gupta et al. (2020), who investigated the impact of assistive technology on learning outcomes for students with impairments, further highlighted the significance of incorporating it into educational settings.

Experimental Interventions and Policy Analysis

Positive results in improving digital literacy and learning outcomes for students with SLD have been found in experimental research. For instance, Kaur et al. (2023) examined digital inclusion tactics specific to SLD kids, whereas Bhatia and Singh (2021) [20] illustrated how mobile technology affects learning results. [4, 10] In their analysis of policy initiatives meant to improve digital inclusion, Jain and Kumar (2022) emphasized the necessity of all-encompassing approaches that tackle systemic inequalities in education as well as access hurdles. [7] In their discussion of the benefits and drawbacks of utilizing digital platforms for inclusive education, Singh and Verma (2021) [20, 24] emphasized how these platforms can improve accessibility.

Theoretical Frameworks and Future Directions

Theoretical frameworks such as the Social Cognitive Theory with an emphasis on the function of observation and reinforcement in learning behaviors serve as the foundation for several interventions. Future studies should concentrate on tackling systemic barriers and scaling up successful interventions to guarantee fair digital inclusion for all Indian students with SLD. The significance of continuing research in this field is emphasized by studies such as those conducted by Jha and Singh (2023) and Verma and Kumar (2021), [24]especially when evaluating the efficacy of assistive devices and digital literacy initiatives. [8] In general, closing the digital divide for kids with SLD necessitates a multipronged strategy that incorporates instructional breakthroughs, technology advancements, and legislative initiatives.

METHODS AND MATERIALS

Methodological Approach to Searching

The scope of this study comprises studies done in school educational settings with a specific focus on students with Specific Learning Disabilities (SLD) in order to ensure comprehensiveness. This scope was selected in order to find focused treatments and to document the distinct ways that the digital divide impacts students with SLD in India. This study used the three systematic stages of identification, screening, and eligibility put forward by Shafril et al. (2021) in order to find relevant papers. The authors made sure that the systematic literature review was transparent and well-structured by putting these procedures into practice.

Identification

Two primary keywords were found by the study based on the research questions: digital divide and specific learning disability (SLD). These keywords were enhanced by the researcher using:

1. Using online thesauri (like Thesaurus.com) to look up synonyms, similar terms, and variants.
2. Making reference to keywords from earlier research.
3. Refining the terms by speaking with peers and subject matter experts.

The following three databases keyword combinations were processed using Boolean operators and phrase search, among other search functions: ERIC (Education Resources Information Center), PubMed, Directory of Open Access Journals (DOAJ)

The following table 1 presents the comprehensive search approach employed in the databases.

Screening

In the screening phase, 140 identified publications were evaluated for relevance based on their titles and abstracts, and 100 were retained for full-text evaluation based on inclusion and exclusion criteria.

Inclusion Criteria

- Studies focusing on students with Specific Learning Disabilities (SLD).
- Research exploring digital divide, digital literacy, or assistive technologies in the Indian context or similar settings.
- Peer-reviewed articles published in the last 10 years.
- Open-access articles to promote accessibility.

Exclusion Criteria

- Studies focusing on physical disabilities or non-learning-related disabilities.
- Articles targeting higher education or adult learners.
- Research from developed countries not transferable to India.
- Paid articles, conference proceedings, or book chapters.

Eligibility

The inclusion/exclusion criteria were thoroughly evaluated in relation to the remaining 100 full-text articles.

- 54 articles were eliminated during this phase because they were irrelevant, included insufficient information, or did not address learning disabilities or the digital divide.
- 46 articles advanced to quality appraisal.

Table 1. Systematic Search Strategy.

Database	Search terms
ERIC	"SLD" OR “Specific Learning Disability” AND "digital divide" AND India
PubMed	"learning disabilities" OR "SLD" AND ("digital literacy" OR "digital accessibility")
DOAJ	"assistive technologies" OR “ICT” AND "inclusive education" AND "India"

Table 2. PRISMA.

Stage	Count	Details
Records Identified	150	Retrieved from ERIC, PubMed, DOAJ, Taylor & Francis Online, and Google Scholar.
Duplicates Removed	40	Duplicate records removed after cross-checking across databases.
Records Screened	110	Titles and abstracts reviewed to identify relevance to digital divide and SLD in India.
Full-Text Articles Assessed	52	Full papers were reviewed for eligibility based on criteria.
Articles Excluded	58	Excluded for reasons such as:
		- Focus on higher education or adults.
		- Non-relevance to digital divide or learning disabilities.
		- Irrelevant geographical context.
Studies Included	36	Studies fully aligned with the objective and inclusion criteria.

Quality Appraisal

The chosen studies were subjected to a comprehensive quality assessment utilizing the Mixed Methods Appraisal Tool (MMAT) developed by Hong et al. in order to guarantee rigor. This tool assesses the methodological quality of qualitative, quantitative, and mixed-methods studies TABLE: 2 to 4

Criteria for Quality Appraisal:

1. Suitability of the study design for addressing the research questions.
2. Relevance and clarity of data collection methods.
3. Validity of findings and their alignment with study objectives.

Based on this process, 36 studies were included in the final review.

Overview of Findings

Despite governmental initiatives like DIKSHA, e-Pathshala, and NISHTHA teacher training, students with Specific Learning Disabilities (SLD) in India still experience digital exclusion, according to this comprehensive literature evaluation (NCERT, 2022; Ministry of Education, 2020). [5, 6, 13, 15, 18] According to research, assistive technology is essential for improving SLD students' digital accessibility (Neeraja & Anuradha, 2016). [16] However, there are still significant obstacles in the form of poor policy enforcement, a shortage of qualified teachers, and implementation issues (Singh et al., 2017). [21]

The Role of Assistive Technology in Digital Inclusion

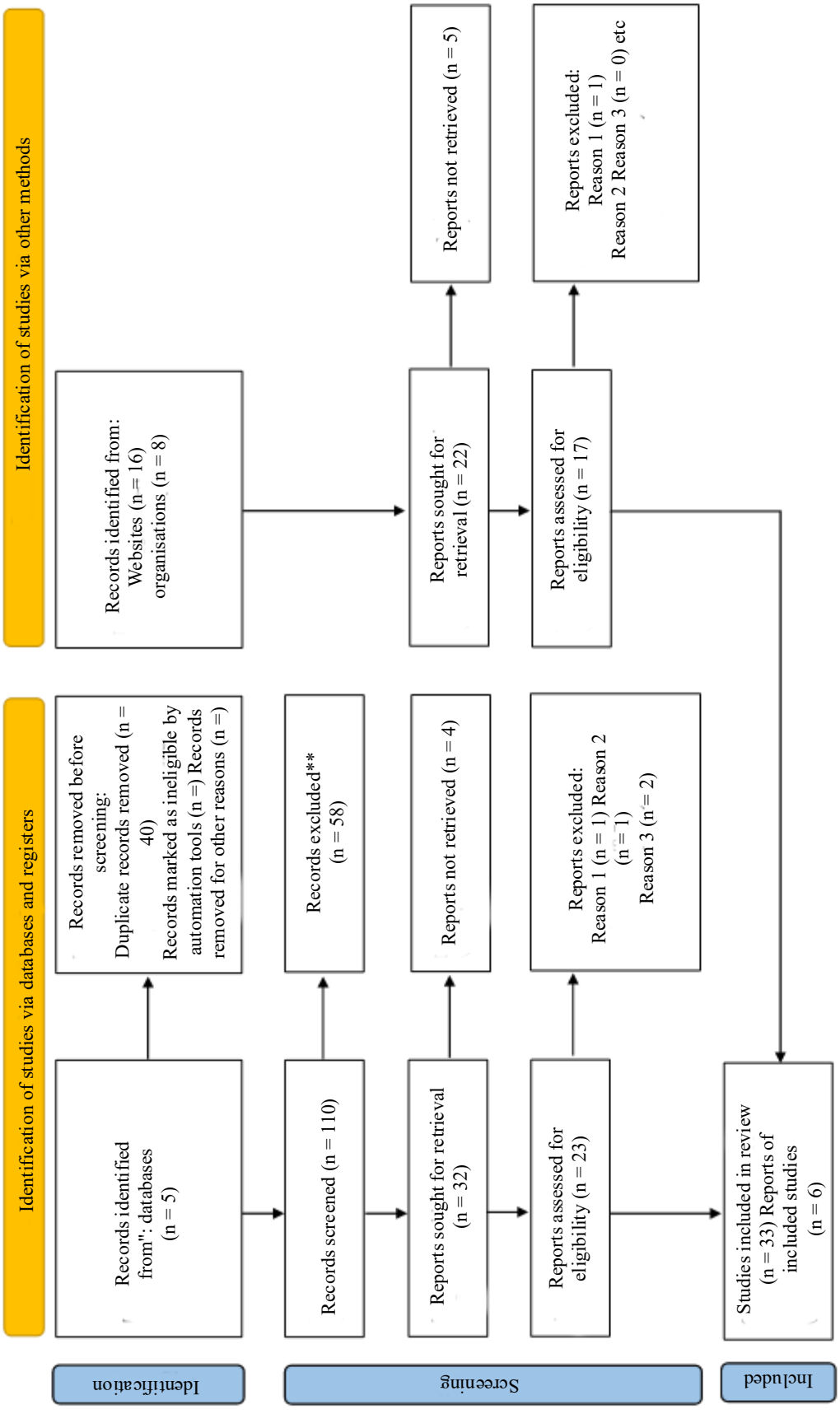
According to Neeraja and Anuradha (2016), [16] research shows that assistive technology (AT) is crucial for helping people with learning difficulties, especially when it comes to reading, writing, and comprehension. Due to financial constraints, a lack of training for teachers, and inadequate integration with digital learning platforms, AT adoption in India is still limited (Bansode & Patil, 2011). [3] TABLE 5

Key Barriers to Digital Inclusion for SLD Students in India

Limited access to assistive technologies

Government e-learning platforms lack key accessibility features like speech-to-text, real-time captions, and adaptive learning (NCERT, 2022) [15]. High costs of assistive technology prevent low-income families from accessing critical learning tools (Singh et al., 2017). [21] Rural students face internet connectivity issues, making online AT tools impractical (Mukherjee, 2023). When taken as a whole, these obstacles exacerbate the educational gap and severely penalize children with impairments. Policy changes, reasonably priced assistive technology, and infrastructure upgrades are needed to address these issues.

Table 3. PRISMA flowchart.



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

Table 4. Dimensions extracted.

Dimension	Key findings
Barriers	Infrastructure issues, lack of teacher training, socio-economic barriers, limited parental digital literacy.
Interventions	Assistive devices, mobile technology, free educational resources, government programs, inclusive policy frameworks.
Outcomes	Measurable improvement in digital literacy and educational inclusion with targeted interventions.
Unresolved Gaps	Need for scalability of programs, teacher upskilling, and rural outreach.

Table 5. Function ad challenges of assitive technology.

Assistive technology type	Function for SLD students	Challenges in india
Speech-to-Text Software	Helps students with dyslexia convert speech into written text.	High cost, limited access in rural areas (Singh et al., 2017). [21]
Text-to-Speech Tools	Reads digital content aloud, improving comprehension.	DIKSHA & e-Pathshala lack built-in TTS features (NCERT, 2022). [5, 6, 15]
Digital Mind Maps	Supports students in organizing and structuring information.	Not integrated into Indian curricula (Neeraja & Anuradha, 2016).[16]
Gamified Learning Apps	Makes learning interactive for students with ADHD.	Limited development of localized, accessible tools (Kilaru & Potluri, 2025). [11]

Teacher training & policy challenges

NISHTHA training focuses on general digital literacy but does not include assistive tech integration for SLD students (NCERT, 2022). [15, 18]Many teachers remain unaware of evidence-based strategies for supporting SLD students (Neeraja & Anuradha, 2016). [16] The efficacy of inclusive education is limited because teachers lack the specialized training necessary to meet the different learning requirements of their students. Reforming policies and providing specialized training on assistive technologies for SLD support are necessary to close this gap.

Socioeconomic & regional disparities

Rural-Urban Divide: Urban students have greater Wi-Fi connectivity and smart classrooms, whereas rural schools lack basic digital infrastructure (Bansode & Patil, 2011). [3] Gender Disparity: Girls with SLD are less likely to receive digital education due to societal norms (Verma & Singh, 2023). [24] By restricting marginalized populations' of equitable access to education, these differences widen the digital divide. To address these geographical and socioeconomic divides, community-based projects and focused legislative actions are essential.

Limitations

There are a number of limitations on this comprehensive systematic literature review. It may overlook earlier but relevant research because it concentrates on open-access, peer-reviewed studies conducted during the last 10 years. It's possible that significant studies from other databases and grey literature were missed due to the dependence on ERIC, PubMed, and DOAJ Furthermore, even though MMAT evaluates quality, using secondary data may add biases. Real-time insights about digital accessibility for students with SLD are limited by the absence of primary data gathering. Additionally, the lack of region-specific interventions limits wider applicability even while obstacles including teacher readiness and socioeconomic disparities are highlighted (Neeraja & Anuradha, 2016), OECD. (2021). [16, 19] These gaps should be filled by future studies.

DISCUSSION

A thorough analysis of research on closing the digital divide for Indian schoolchildren with SLD reveals a number of important themes and conclusions. Although it is acknowledged that digital literacy is essential to advancing inclusive education, obstacles including cost and parents lack of digital literacy continue to exist (Badiuzzaman, 2024; Mishra et al., 2022). [2]According to Neeraja and Anuradha (2016) [16] and Jindal and Sahu (2020), assistive technology is essential for improving learning

outcomes for kids with SLD; nevertheless, systemic deficiencies in teacher preparation and technology availability must be addressed (Ahuja, 2021). [1, 9] While experimental studies demonstrate the potential of customized digital literacy programs and assistive technologies in enhancing learning outcomes (Bhatia and Singh, 2021; Kaur et al., 2023),[4, 10, 20] proposed frameworks for inclusive digital education place an emphasis on technological and policy solutions to address access gaps (Nedungadi et al., 2018). [17] In order to guarantee fair digital inclusion for all SLD students in India, future research should concentrate on expanding successful interventions and removing structural obstacles, using theoretical frameworks such as the Social Cognitive Theory to guide practice (Jha and Singh, 2023; Verma and Kumar, 2021). [24]

CONCLUSION

India has well-structured digital education policies, as this review demonstrates, but their efficacy for SLD kids is limited by their poor implementation. The government must give priority to teacher training, SLD-specific digital regulations, and more funding for assistive technologies in order to close the gap. Future studies should examine the effects of digital interventions on the social and academic growth of SLD students. To achieve real digital inclusivity in Indian education, lawmakers, educators, and technology experts must work together in collaboration.

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