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Teacher Communication Strategies for Supporting Participation and Engagement Among Deaf and Hard-Of-Hearing (Dhh) Students: A Systematic Review

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Abstract. This systematic literature review synthesizes empirical evidence from forty studies published between 2007 and 2025 to examine how teacher communication strategies support participation, social interaction, and academic engagement among deaf and hard-of-hearing (DHH) students. Guided by PRISMA 2020 and appraised using the mixed methods appraisal tool (MMAT 2018), the review integrates qualitative, quantitative, and mixed-methods research across diverse educational contexts. Thematic synthesis identified eight interrelated domains: multimodal and technological communication, adaptive pedagogy, environmental and acoustic accessibility, student agency, peer collaboration, teacher competence, cultural-linguistic identity, and interactive literacy engagement. Findings indicate a clear pedagogical shift from predominantly auditory-based instruction toward multimodal, visually accessible, and technology-supported communication practices. Effective teacher communication is characterized by flexibility across visual, auditory, and tactile modes, supported by assistive technologies and relational responsiveness. However, persistent challenges remain, including disparities in teacher preparation, access to assistive technologies, and uneven regional representation in the literature. This review highlights the importance of sustained teacher professional development, inclusive policy frameworks, and cross-cultural collaboration to strengthen communicative equity and support meaningful inclusion for DHH students in classroom settings.

Keywords: Deaf and hard of hearing (DHH); teacher communication strategies; inclusive education; multimodal learning; assistive technology

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1. Introduction

Education for the deaf and hard-of-hearing (DHH) has experienced significant development in the past few decades and has largely mirrored, in a global context, the transformation toward inclusive and equitable education practices (Espada-Chavarria et al., 2023). International policy agenda and inclusive education reform increasingly focus on the right of DHH students to equal meaningful access, participation, and engagement in mainstream educational context (UNESCO, 2016). As a result, DHH learners are now more frequently educated alongside hearing peers, positioning mainstream classrooms as critical sites for inclusive practice.

In such circumstances, effective communication between teachers and students is important as this facilitates both academic and social progressiveness (Holcomb et al., 2024). But inclusive placement alone does not translate into inclusion in practice. Educators are still prepared to respond to DHH students using communication strategies that allow for linguistic diversity and multimodal learning experiences (Cannon et al., 2022; Mandiyata, 2018; Qin, 2025). This disparity between inclusive policy intent and classroom-level communicative practice remains one of the foremost barriers to equitable opportunities for DHH students to learn

Pedagogical communication strategies that integrate verbal, non-verbal, and multimodal modes are considered critical for enhancing the quality and engagement of DHH education. These features are sign-supported speech, visual scaffolds, captioning, gestures, eye contact, and assistive technologies (Bintoro et al., 2023; Dzulkifli et al., 2020; Zhang et al., 2025). These strategies promote understanding, engagement, and learner agency when used properly and are effective, and serve as aids to literacy and self-advocacy (Flórez Aristizábal et al., 2017). However, existing implementation is fragmented and poorly grounded in specific educational contexts, demonstrating the need of further development of evidence-based frameworks that associate multimodal communication with inclusive classroom practice.

Meanwhile, DHH education has grown rapidly over the past twenty years with developments in the use of assistive technology, an ongoing shift toward multimodal pedagogy, and increased respect for the views of DHH students. However, these are limited to research findings, as they are spread across disciplines, methodologies, and geographical contexts, such that it may be challenging for educators and policymakers to discover coherent patterns or evidence-informed approaches.

To remedy this, a systematic review of what studies do exist needs to be built. Under the guidance of PRISMA principles (Page et al., 2021), this systematic review presents a clear and rigorous synthesis across three types of research: the quantitative, qualitative, and mixed-methods literature that has studied teacher communication with DHH students. Combining evidence from several different research designs and across settings, this review attempts to contribute to understanding what communication approaches are used, how they work on the

ground and, in what circumstances, what makes participatory, social and academic engagement possible. The findings seek to produce evidence that teachers can be trained and improved, supporting classroom practice and policy development in inclusive education.

2. Problem Statement

Effective communication is central to successful teaching and learning. This is especially critical for students with discrete communicative needs, including those who are DHH. In mainstream classrooms where auditory access is often assumed, DHH students encounter barriers that can lead to reduced participation, social isolation and underachievement (Antia et al., 2011; Todorov et al., 2022). Teachers frequently lack adequate preparation or training to adapt their instructional strategies, perpetuating inequities in access to education (Guynes & Wood, 2024; Hankebo, 2018; Musyoka & Gentry, 2020).

A wide range of communication strategies spanning sign language, visual aids, and assistive technologies has been documented in the literature. However, evidence indicates that the effectiveness of these strategies is highly conditional on contextual factors, including students' language backgrounds, age, hearing profiles, classroom cultures, and institutional support structures (Atika et al., 2023; Holcomb et al., 2024; Johnson et al., 2024; Silvestri & Hartman, 2022). Strategies that appear effective in one context may not translate directly to another, creating uncertainty for educators seeking to make informed pedagogical decisions (Mandyata, 2018).

Compounding this challenge is the fragmentation in the existing research base. Primary studies differ widely in focus, design and methodology. Some explore academic engagement (Antia et al., 2020; Cruz, 2025), others highlight social interaction (Antia et al., 2011; Booth et al., 2024), and still others investigate teacher perceptions (Bedoin, 2011; Musyoka & Gentry, 2020). Research methods range from qualitative interviews and classroom observations to quantitative surveys and mixed-method designs, often employing inconsistent definitions of key outcomes such as participation, engagement, and effectiveness. This heterogeneity impedes the development of generalizable conclusions and robust pedagogical recommendations (Güven et al., 2022; Skrebneva & Fordham, 2024).

Narrative reviews in the field have highlighted important aspects of DHH education. However, many of these reviews are constrained by methodological limitations, including insufficient transparency and vulnerability to bias (Bahl, 2023; Mohamed Shaffril et al., 2021). The absence of a comprehensive and methodologically rigorous synthesis leaves educators and policymakers without a clear evidence base to guide communication practices in inclusive classrooms. A systematic literature review (SLR) is therefore required to consolidate existing findings, identify patterns and gaps, and evaluate the strength of evidence across diverse research designs.

This review addresses the existing gap by synthesizing evidence on teacher communication strategies for DHH students across quantitative, qualitative, and

mixed-method studies. In doing so, it seeks to clarify which strategies are reported in the literature, how they are perceived and experienced by DHH students, and how findings differ across methodological approaches. It is guided by the following questions:

Main RQ is:

RQ1: What teacher communication strategies are reported in the literature to support participation, social interaction, and academic engagement among deaf and hard-of-hearing (DHH) students in classroom settings?

Sub-RQs are:

Sub-RQ1: What evidence is reported on DHH students' perspectives regarding teacher communication strategies in classroom settings?

Sub-RQ2: What similarities and differences are reported between quantitative and qualitative studies on the effectiveness of teacher communication strategies for enhancing participation, social interaction, and academic engagement?

3. Methodology

This study employed a systematic literature review (SLR) to identify, analyze, and synthesize empirical evidence on teacher communication strategies in the education of DHH students. A structured protocol based on the PRISMA-P checklist was developed prior to the literature search to define eligibility criteria, information sources, search procedures, data extraction, and quality appraisal, ensuring transparency and replicability (Moher et al., 2015). The review process followed PRISMA 2020 guidelines, progressing through identification, screening, eligibility assessment, and final inclusion of studies (Cumming et al., 2023; Page et al., 2021). In addition, the quality appraisal framework was adapted from King et al. (2020) to address common methodological limitations in special and inclusive education reviews, thereby strengthening the objectivity, validity, and reliability of the review.

3.1 Identification

The review covered the period 2007–2025 to capture the emergence and consolidation of inclusive education policies in relation to DHH education. This timeframe also reflects the expansion of multimodal and technology-assisted communication practices, as well as the growing empirical focus on teacher communication strategies for DHH students across diverse educational contexts. The search strategy incorporated Boolean operators and combinations of refined keywords related to teacher communication and DHH education.

For the population terms, search strings included terms such as deaf, hard-of-hearing, hearing impaired, and DHH students. For the intervention/phenomenon of interest, terms included teacher communication, teaching strategies, instructional communication and classroom communication. For educational context, terms included inclusive education, special education, school, primary education, secondary education and K–12. Synonyms and variations were tested using truncations such as *educat** to capture both education and educational. The search strings used in the selected databases are given in Table 1.

The literature search using database-specific adaptations was limited to Scopus and Web of Science (WOS) only. These databases were selected to ensure comprehensive and widely recognised multidisciplinary citation databases. They offer high-quality, peer-reviewed literature with rigorous indexing standards (Pranckutė, 2021). As of October 2025, an initial total of 125 records was retrieved before removing duplicates and proceeding to screening.

Table 1: The search strings used in the selected databases

Database	Keyword
SCOPUS	TITLE-ABS-KEY((deaf OR "hard of hearing" OR "hearing impaired" OR "DHH student*" OR "students with hearing loss") AND ("teacher communication" OR "teaching strateg*" OR "instructional communication" OR "classroom communication") AND ("inclusive education" OR "special education" OR school* OR "primary education" OR "secondary education" OR "K-12" OR educat*))
Web of Science (WOS)	TS = ((deaf OR "hard of hearing" OR "hearing impaired" OR "DHH student*" OR "students with hearing loss") AND ("teacher communication" OR "teaching strateg*" OR "instructional communication" OR "classroom communication") AND ("inclusive education" OR "special education" OR school* OR "primary education" OR "secondary education" OR "K-12" OR educat*))

3.2 Screening

Screening was the second part of the review. Two independent reviewers reviewed the records against predefined inclusion and exclusion criteria and documented the decisions and reasons for excluding through Microsoft Excel and resolved data discrepancies through discussion. Eligible studies focused on teacher communication strategies in K-12 inclusive or special education contexts, reporting outcomes related to participation, engagement, or social interaction, with selected higher education studies included only when their pedagogical or technology-mediated approaches were transferable to school settings. The review was limited to peer-reviewed publications published between 2007 and 2025 and in English language only.

3.3 Eligibility

The eligibility phase involved a full-text review of forty studies to assess compliance with predefined inclusion criteria, with abstracts, methodologies, findings, and discussions independently examined by two reviewers using Microsoft Excel to document decisions and reasons for exclusion, and disagreements resolved through discussion or consultation with a third reviewer. Four studies were excluded due to limited pedagogical focus or lack of applicability to K-12 contexts, resulting in forty studies advancing to the quality appraisal stage, reflecting the methodological rigor and specificity of the review process (King et al., 2020; Talbott et al., 2018). The identification, screening, and eligibility procedures were fully documented in accordance with the PRISMA 2020 framework to ensure transparency and reproducibility (see Figure 1).

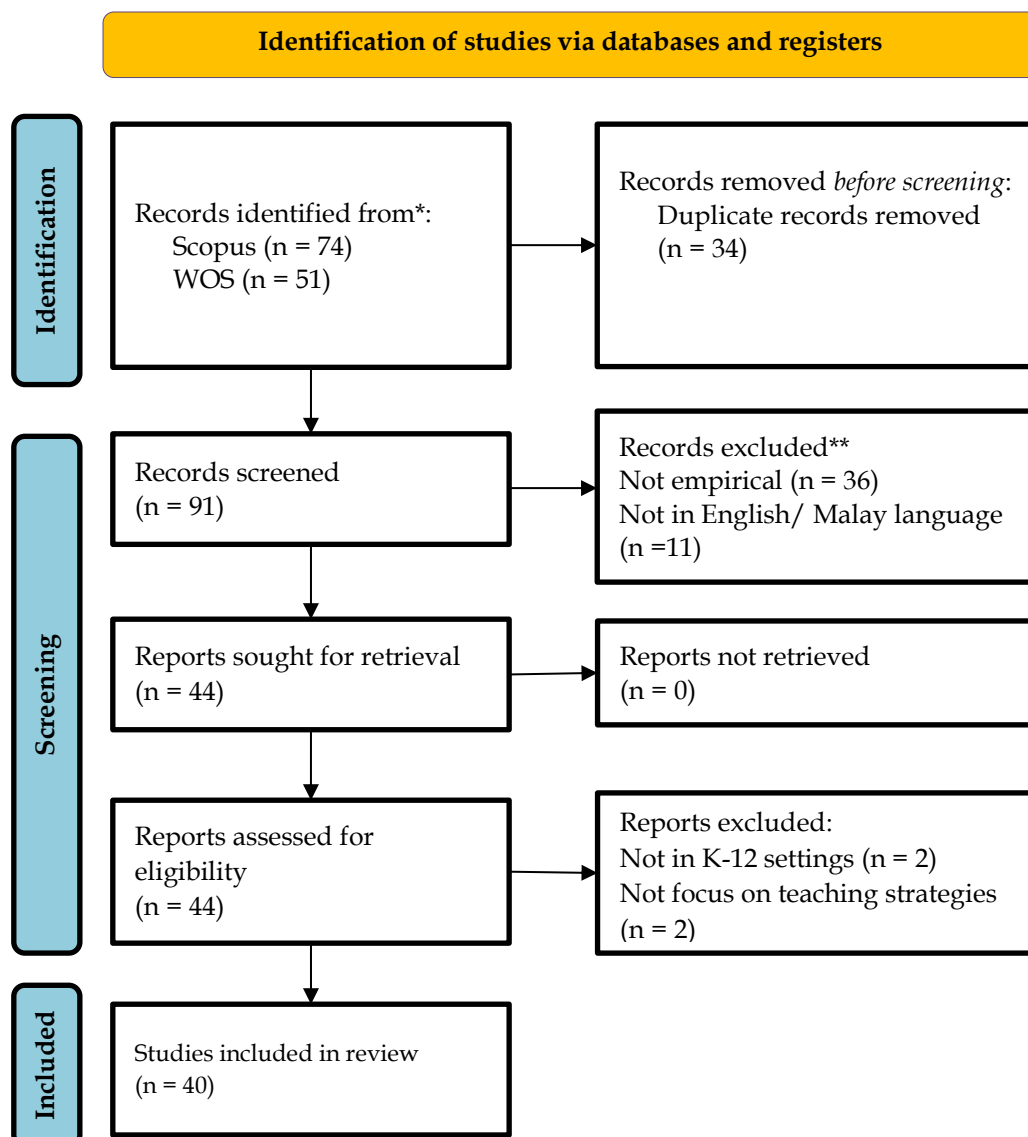


Figure 1: PRISMA 2020 Systematic Literature Flow Diagram

3.4 Quality Appraisal

The quality of included studies was assessed using the mixed methods appraisal tool (MMAT) 2018, which is specifically designed for systematic reviews incorporating qualitative, quantitative, and mixed-methods research (Hong et al., 2018). Studies were first categorized according to their research design (qualitative, quantitative, or mixed methods) and evaluated using the corresponding MMAT criteria. The appraisal results were used as a screening threshold rather than a weighting mechanism, whereby only studies meeting a minimum of three out of five criteria were retained for synthesis (see Table 2).

The quality ratings informed the interpretation of findings rather than serving as exclusion weights. In line with recommendations by King et al. (2020), minor adaptations were made to the appraisal process to enhance transparency in reporting. These adaptations focused on explicitly documenting common methodological limitations in special and inclusive education research, such as

incomplete reporting and variability in study design. Importantly, the core MMAT criteria and scoring structure were not modified. Variability in methodological quality and reporting practices across the included studies, therefore, represents an inherent limitation of the evidence base.

Table 2: Results of quality appraisal

Study	Research Design	QA 1	QA2	QA3	QA4	QA5	Number of criteria fulfilled
Holcomb et al. (2025)	QL	√	√	√	√	√	5/5
Cruz (2025)	MX	C	√	√	C	√	3/5
Zhang et al. (2025)	QN (DC)	√	C	√	C	√	5/5
Melinao Mayorga et al. (2025)	QL	√	√	√	√	√	5/5
Booth et al. (2024)	QL	√	√	√	√	√	5/5
Skrebneva and Fordham (2024)	QL	√	√	√	√	√	5/5
Vyakaranam et al. (2024)	MX	√	√	√	X	√	4/5
Guyen et al. (2023)	QL	√	√	√	√	√	5/5
Espada-Chavarria et al. (2023)	QN (QC)	√	√	√	C	√	4/5
Atika et al. (2023)	QL	√	√	√	√	√	5/5
Bintoro et al. (2023)	QL	√	√	√	√	√	5/5
Al-Hashimi (2022)	QL	√	√	√	X	√	4/5
Farhan and Razmak (2022)	MX	√	√	C	X	C	3/5
Todorov et al. (2022)	QL	√	√	√	√	√	5/5
Rhenals-Ramos and Arango-Patemina (2022)	QN (NR)	√	√	√	X	√	4/5
Hasko et al. (2022)	QN (NR)	√	√	C	√	√	4/5
Salehomoum and Pearson (2020)	QL	√	√	√	√	√	5/5
Antia et al. (2020)	QN (NR)	√	√	√	C	√	4/5
Easterbrooks et al. (2020)	QN (DC)	√	√	√	C	√	4/5
Al-Ibrahim (2019)	MX	√	X	X	√	√	3/5
Dzulkifli et al. (2019)	QL	√	√	√	√	√	5/5

Dhermawati et al. (2019)	QL	√	√	√	√	√	5/5
Krause and Murray (2019)	QN (DC)	√	√	C	√	C	3/5
Scott et al. (2019)	QN(NR)	√	√	√	√	√	5/5
Mandyata (2018)	QL	√	√	√	√	√	5/5
Musyoka et al. (2017)	QL	√	√	√	√	√	5/5
Flórez Aristizábal et al. (2017)	QL	√	√	√	√	√	5/5
Krause and Lopez (2016)	QN (NR)	√	X	√	√	√	4/5
Nelson (2015)	QN (DC)	√	C	√	√	√	4/5
Rekkedal (2015)	QN (DC)	√	√	√	√	√	5/5
Messier and Wood (2015)	QN (NR)	√	√	√	C	√	4/5
Im and Kim (2014)	QN (NR)	C	√	√	X	√	3/5
Ting and Gilmore (2012)	QN (DC)	√	C	√	C	√	3/5
Goldin-Meadow et al. (2012)	QN (NR)	√	√	√	√	√	5/5
Bedoin (2011)	QL	√	√	√	√	√	5/5
Antia et al. (2011)	QN (DC)	√	C	√	C	√	3/5
Allen and Anderson (2010)	QN(DC)	√	√	√	C	√	4/5
Lissi et al. (2009)	QL	√	√	√	√	√	5/5
Enns et al. (2007)	QL	√	√	√	√	√	5/5
Uzuner (2007)	QL	√	√	√	√	√	5/5

Note. QA= Quality assessment; QN (DC)= Quantitative descriptive; QN (NR)= Quantitative non-randomised; QL= Qualitative; MX= Mixed-Method; C= Can't tell

3.5 Data Extraction and Analysis

Data extraction was conducted systematically to answer the research questions. Information coded from each study included author, year, research design, sample characteristics, communication strategies, reported outcomes, and key implications (Satnarine, 2023; Schmidt et al., 2021). These data were entered into a structured extraction matrix to ensure consistency and comparability across qualitative, quantitative, and mixed-methods studies. Two reviewers independently extracted and cross-checked all data to enhance reliability and reduce extraction bias.

Data synthesis followed an inductive thematic approach, suitable for integrating heterogeneous evidence from mixed study designs (Flemming et al., 2019). Initial

coding focused on reported teacher communication practices and associated outcomes. Codes were iteratively refined and clustered into themes following the procedures outlined by Braun and Clarke (2006) and elaborated by Kiger and Varpio (2020). Quantitative findings were integrated by mapping reported outcomes onto qualitative themes, enabling convergence across evidence types. This process resulted in eight overarching themes representing core dimensions of teacher–student communication in DHH education.

4. Results and Findings

This section summarizes key findings from forty empirical studies (2007–2025) on teacher communication strategies for DHH students, highlighting global contexts, varied methodologies, and thematic insights that promote participation and engagement.

4.1 Background of the Selected Studies

A total of forty studies conducted across six continents was included in this review, reflecting diverse educational contexts. The majority originated from North America ($n = 16$), particularly the United States ($n = 14$) and Canada ($n = 2$), accounting for the majority. Asia contributed thirteen studies from countries including Malaysia, Indonesia, Turkey, China, Bahrain, South Korea, the United Arab Emirates, Vietnam, and the Philippines. European research ($n = 3$) came from France, Spain, and Norway while studies from Oceania ($n = 3$) were all based in Australia. In South America, four studies came from Chile and Colombia, while there was only one study from Africa (Zambia). Overall, the distribution shows a concentration of research in North America and Asia, with comparatively limited representation from African and some European regions (see Figure 2).

Analysis of publication trends indicates a steady increase in research output over time. Eight studies were published between 2007 and 2012, followed by seven studies between 2013 and 2017. The most notable growth occurred between 2018 and 2022, during which fifteen studies were published. This trend continued from 2023 to 2025, with ten additional studies identified. The publication pattern reflects sustained research attention to teacher communication strategies for DHH students over the past two decades (see Figure 3).

With respect to research design, the included studies demonstrated a balanced methodological distribution. Nineteen studies employed qualitative approaches, commonly using interviews, classroom observations, or ethnographic methods. Seventeen studies utilized quantitative designs, including surveys, quasi-experimental methods, and structured observations to measure participation, engagement, or communication outcomes. Four studies adopted mixed methods designs, integrating qualitative and quantitative data within a single study. This distribution highlights the use of both experiential and measurement-based approaches in examining teacher communication practices in DHH education (see Figure 4).

Overall, the geographical, temporal, and methodological characteristics of the selected studies provide an empirical context for understanding how teacher

communication strategies for DHH students have been investigated across regions and over time. These background characteristics inform the subsequent thematic analysis of communication strategies reported in the literature.

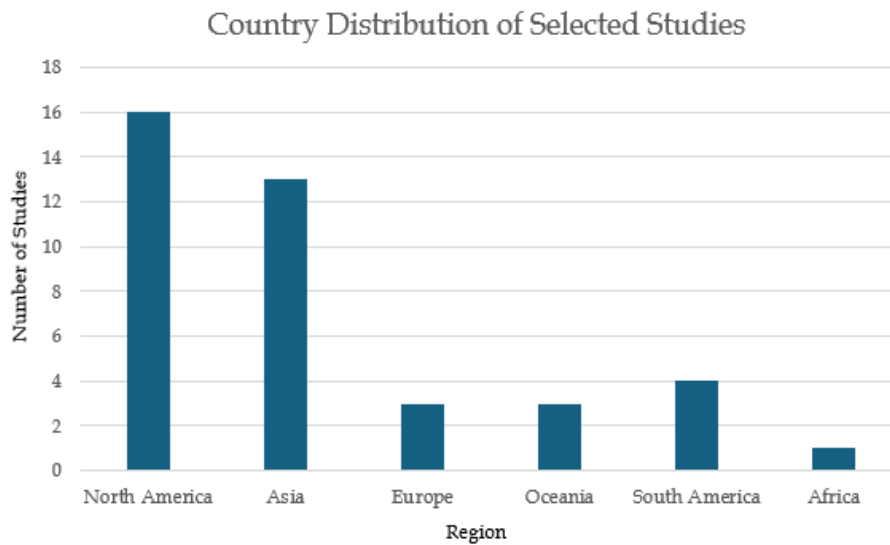


Figure 2: Country Distribution of Selected Studies

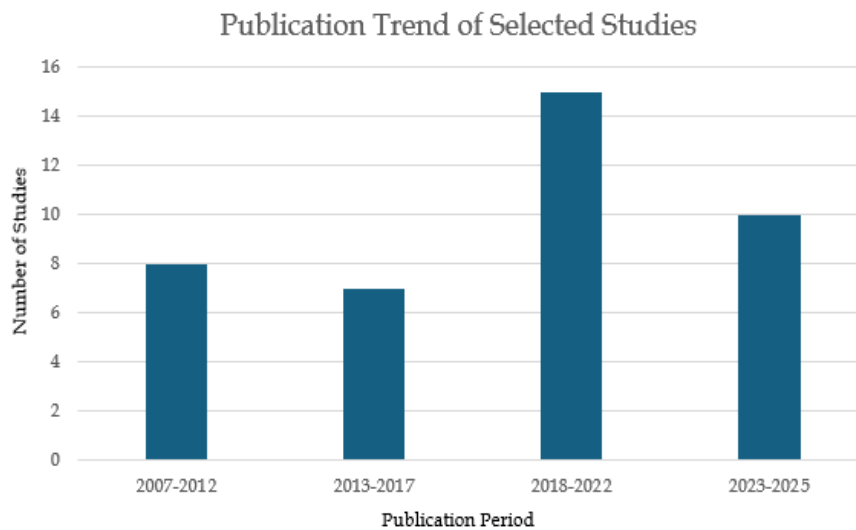


Figure 3: Publication Trend of Selected Studies

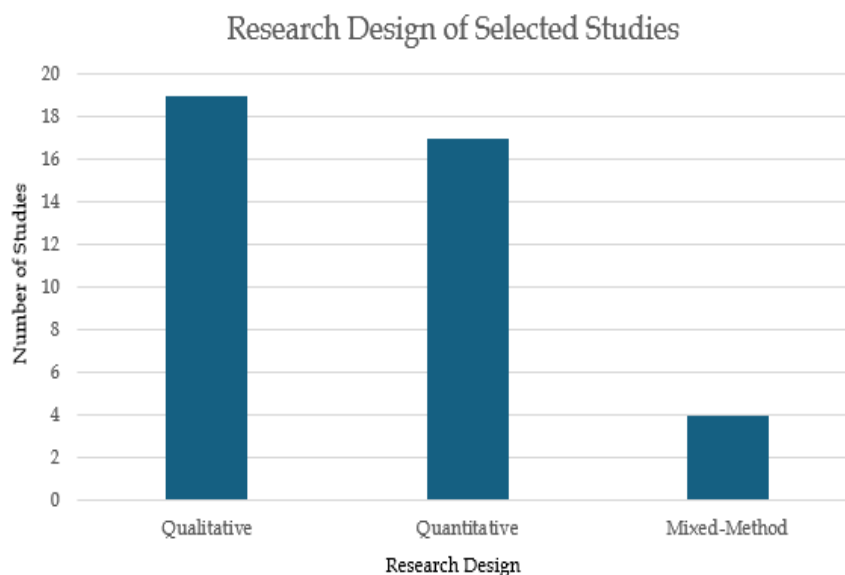


Figure 4: Research Design of Selected Studies

4.2 Research Focus Area

Analysis of the forty included studies identified five primary research focus areas related to teacher communication strategies for DHH students. These included multimodal communication and assistive technologies ($n = 12$), teacher–student interaction and feedback practices ($n = 8$), visual and environmental supports ($n = 7$), teacher beliefs and professional knowledge ($n = 7$), and student engagement and participation metrics ($n = 6$). The distribution of focus areas indicates that a substantial proportion of the literature examines communication strategies that support access, interaction, and participation in classroom settings.

Across the reviewed studies, commonly reported teacher communication strategies included the use of sign-supported speech, captioning, gestures, written scaffolds, and digital or assistive technologies. Studies focusing on interaction and feedback documented strategies such as explicit turn-taking cues, visual confirmation of understanding, and adaptive instructional pacing. Research addressing visual and environmental supports reported the use of classroom layout adjustments, visual schedules, and enhanced lighting or acoustic arrangements. Collectively, these focus areas demonstrate that teacher communication strategies for DHH students are predominantly multimodal and visually mediated, with emphasis on facilitating participation, comprehension, and classroom interaction.

4.3 The Emergent Themes

Thematic synthesis of the forty included studies identified eight interrelated domains of teacher communication strategies for DHH students. These domains comprised multimodal and technological communication, adaptive and responsive teaching practices, environmental and acoustic accessibility, student agency and self-advocacy, collaborative and peer-supported learning, teacher training and beliefs, cultural and linguistic identity, and interaction and literacy

engagement. Together, these themes represent the main categories through which teacher communication practices were examined across the reviewed literature.

Across studies employing qualitative methods, students' perspectives highlighted the importance of visually accessible and interactive communication practices. Reported strategies included sustained visual contact, the use of clear sign-supported or written cues, structured turn-taking, and opportunities for reciprocal interaction. These practices were consistently described as shaping students' classroom experiences in terms of comprehension, participation, and communication confidence. The eight themes provide an empirical framework for understanding how teacher communication strategies are conceptualised and operationalised in DHH classroom contexts.

4.4 Comparison Across Research Designs

Comparative synthesis across qualitative, quantitative, and mixed-methods studies revealed complementary patterns in how teacher communication strategies for DHH students have been examined. Each research design contributed distinct forms of evidence regarding participation, engagement, and classroom interaction.

Quantitative studies primarily reported measurable outcomes associated with multimodal communication strategies. These studies documented improvements in participation, engagement, and literacy-related outcomes following the use of captioning, FM systems, visual scaffolds, and other technology-supported communication tools (Antia et al., 2011; Hasko et al., 2022). Findings were commonly reported using statistical indicators to demonstrate associations between communication strategies and student outcomes.

Qualitative studies, in contrast, focused on experiential and interactional dimensions of teacher communication. Through interviews and classroom observations, these studies reported how practices such as sustained visual contact, adaptive responsiveness, explicit feedback, and relational attunement were perceived by students and teachers in inclusive classroom contexts (Booth et al., 2024; Musyoka & Gentry, 2020; Skrebneva & Fordham, 2024). These studies highlighted how communication practices were experienced in daily classroom interactions.

Mixed-methods studies integrated both approaches by reporting quantitative outcomes alongside qualitative accounts. These studies linked observed improvements in engagement or participation with contextual descriptions of visual accessibility, communicative alignment, and teacher responsiveness (Al-Ibrahim, 2019; Farhan & Razmak, 2022). The combined evidence illustrates how different research designs contribute complementary perspectives on teacher communication strategies for DHH students.

4.5 Summary of Key Findings

A synthesis of the forty included studies indicates that teacher communication strategies for DHH students are predominantly multimodal, adaptive, and interaction oriented. Across the reviewed literature, commonly reported practices

included the integration of sign-supported communication, spoken and written supports, assistive technologies, and visual scaffolding. These strategies were consistently associated with reported outcomes related to participation, comprehension, and classroom engagement.

Evidence drawn from qualitative, quantitative, and mixed-methods studies shows convergence in the emphasis on visually accessible and interactive communication practices. The reviewed studies also documented a shift in instructional approaches from primarily auditory-based methods toward interaction-focused and technology-supported communication. However, the distribution of studies revealed uneven representation across regions and variability in reported access to teacher training and assistive technologies, providing important contextual patterns within the existing evidence base.

5. Discussion

The discussion highlights the shift in DHH education toward multimodal, technology-supported communication approaches that promote inclusive participation and equitable learning.

5.1 Integration of Multimodal and Technological Strategies

The findings indicate that the integration of multimodal and technology-supported communication strategies plays a central role in addressing linguistic and sensory diversity among DHH students. Consistent with previous studies, combining visual, auditory, and kinesthetics modes such as sign-supported instruction, written scaffolds, captioning, interactive digital texts, and gamified learning supports differentiated access to content and sustained classroom participation (Cruz, 2025; Holcomb et al., 2024; Ubur, 2025; Zhang et al., 2025). These approaches align with multimodal learning theories, which emphasize the importance of multiple representational channels in supporting comprehension and meaning making for learners with diverse communicative profiles.

Technology-mediated tools, including transliteration systems, digital storybooks, and emerging sign-recognition applications, were found to function as mediators between spoken, signed, and written language forms. Rather than replacing teacher-student interaction, these tools appear to extend communicative possibilities by enhancing visual accessibility and supporting flexible instructional pacing. These finding aligned earlier work highlighting the role of assistive technologies in reducing access barriers while preserving pedagogical responsiveness (Chauhan et al., 2024; Khandaqji et al., 2025).

However, the effectiveness of multimodal and technological strategies is not solely determined by the availability of tools. The reviewed studies suggest that meaningful integration depends on teachers' pedagogical judgement, communicative competence, and capacity to adapt strategies to learners' linguistic preferences and classroom contexts. Technology-supported environments were most effective when embedded within reflective teaching practices that emphasised feedback, interaction, and ongoing adjustment of instructional approaches (Holcomb et al., 2024). This underscores the importance

of viewing multimodality not as a technical solution, but as a pedagogical orientation grounded in inclusive communication principles.

5.2 Adaptive Pedagogy and Teacher Responsiveness

Adaptive pedagogy in DHH education foregrounds teachers' capacity to respond flexibly to students' linguistic, sensory, and cognitive diversity. The reviewed studies indicate that effective teachers adjust instructional strategies in real time by integrating sign, spoken, and visual modes to support access, interaction, and engagement (Holcomb et al., 2024). Responsiveness is closely linked to teachers' situational awareness and their ability to interpret ongoing feedback, which enables more inclusive participation and supports students' communication confidence (Booth et al., 2024; Rhenals-Ramos & Arango-Paternina, 2022).

Evidence also indicates that hands-on and collaborative learning pedagogies help enhance communication and literacy development of DHH students (Tariq, 2025; Wolbers et al., 2024). The results also imply that continuing to support adaptive practice entails structured professional support, involving mentoring, along with purposeful professional learning activities to grow teachers' multimodal competence and reflective practice (Musyoka & Gentry, 2020; Pérez-Jorge et al., 2021).

5.3 Environmental, Cultural, and Linguistic Dimensions

Effective communication in DHH education is closely shaped by environmental conditions that influence accessibility and interaction. The reviewed studies indicate that classroom acoustics, visual access, and spatial design play a critical role in supporting comprehension and participation (Rekkedal, 2015; Todorov et al., 2022). Teachers who implement multimodal environmental supports, such as captioning, sound field systems, and clear visual cues, contribute to more equitable learning conditions. These physical and visual adaptation function most effectively when situated in the context of a larger sociocultural appreciation of Deaf identity and linguistic diversity in inclusive communication (Booth et al., 2024; Dzulkifli et al., 2020).

Moreover, the communication and learning results of DHH students are augmented by linguistic practices based on the bilingual or bimodal-bilingual frameworks for communication and learning. Studies report that integrating sign, spoken, and written languages supports cognitive flexibility and affirms students' cultural and linguistic identities (Al Hashimi, 2022; Bruwer et al., 2024; Herdianty et al., 2019). Teaching and learning strategies in culturally responsive classrooms identify sign languages as full language systems and integrate them with visual literacy interventions aimed at facilitating participation, agency, and communicative confidence in their use as learners' communicative experience in the classroom.

5.4 Student Agency and Peer Collaboration

Student agency is identified in the findings of the reviewed studies as a key construct of inclusive communication in DHH teaching. Research indicates that classrooms which support cooperative learning, peer mentoring, and interactive dialogue enable students to take more active roles in negotiating meaning and

expressing understanding (Antia et al., 2011; Skrebneva & Fordham, 2024). Within such contexts, communication is positioned as a shared process rather than a teacher-directed exchange, allowing DHH students to participate more actively in classroom interactions.

Instructional strategies including gamified learning, arts-based activities, and group-based projects enhance peer collaboration. These approaches are reported to support engagement by creating opportunities for shared expression and social connection among learners (Cruz, 2025; Melinao Mayorga et al., 2025). Across the reviewed literature it highlighted the transition from a primary focus on structural accessibility toward relational dimensions of learning, underlining that peer interaction and mutual support are important mechanisms to maintaining participation and communicative confidence in multimodal classroom environments.

5.5 Implications for Teacher Training and Policy

The findings underscore the central role of teacher expertise and belief systems in implementing inclusive, multimodal communication practices for DHH students. The reviewed studies indicate that educators require sustained professional development, mentoring, and structured training to integrate linguistic, technological, and cultural competencies effectively (Musyoka & Gentry, 2020). Professional learning grounded in bilingual, adaptive, and inclusive pedagogies has been shown to enhance teachers' responsiveness and instructional flexibility (Al Hashimi, 2022; Atika et al., 2023). These findings suggest that pre-service and in-service teacher education programs should systematically embed multimodal communication strategies, Deaf cultural literacy, and assistive technology competence to strengthen pedagogical confidence and consistency (Abdraimova et al., 2025).

From a policy view, frameworks for inclusive education must work toward developing continuity of professional learning, cooperative social networks, and access to digital and assistive infrastructure. The evidence also points to the importance of aligning teacher training initiatives with evolving technological developments, ensuring that educators are supported as reflective practitioners in diverse classroom contexts (Almulhim, 2025; Xerri, 2025). Further research should examine the long-term impact of multimodal and technology-mediated communication strategies, particularly as emerging tools such as artificial intelligence and virtual reality increasingly shape inclusive, communication-rich learning environments for DHH students.

6. Conclusion

This systematic literature review synthesized findings from forty empirical studies published between 2007 and 2025 to examine teacher communication strategies that support participation, social interaction, and academic engagement among DHH students. The review confirms that effective teacher communication is fundamental to achieving equitable and inclusive learning in classroom settings, with clear evidence of a shift from predominantly speech-based

instruction toward multimodal, visually accessible, and technology-supported communication practices.

In response to the first research question, the review identified a range of teacher communication strategies, including sign-supported instruction, visual scaffolding, captioning, assistive listening technologies, and adaptive interactional practices, which were consistently reported to enhance access to instruction, comprehension, and classroom participation. Evidence addressing DHH students' perspectives highlights the importance of communication that is visually clear, relational, and culturally responsive, emphasising reciprocal interaction, recognition of Deaf identity, and responsiveness to individual communicative preferences.

Comparisons across quantitative, qualitative, and mixed-methods studies revealed complementary patterns of evidence, with quantitative research documenting measurable improvements in engagement and literacy, while qualitative and mixed-methods studies illuminated the contextual and experiential factors underpinning these outcomes. Despite these positive trends, however, persistent challenges remain, including gaps in teacher preparation, uneven access to assistive technologies, limited representation from underrepresented regions, and methodological heterogeneity that constrains generalizability.

In conclusion, this review provides a unified and up-to-date overview of teacher communication strategies implemented in DHH education and contributes to ensuring that inclusive communication is entrenched as a professional competency to be supported with continued teacher training, institutional commitment and responsive education practice to ensure communicative equity and meaningful participation for DHH learners.

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8. References

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