

Educational Protocol Proposal to promote the inclusion of students with hearing loss in mainstream classrooms

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Abstract

Thanks to universal newborn hearing screening programs, deafness is diagnosed early, enabling effective treatments with hearing aids and cochlear implants. This facilitates the development of functional oral language and promotes participation in educational and social activities, as long as effective and early access to interventions is guaranteed according to the type and degree of hearing loss. However, even with hearing devices, children may have difficulty understanding speech in noisy environments, which causes problems accessing academic content, attention difficulties, and auditory fatigue. In this study, based on a comprehensive literature review and an expert consensus process, it was concluded that ongoing training of teaching staff, families and students with and without hearing loss is key to promoting full inclusion in the

Findings, Limitations, Perspectives and Considerations

Findings

- The protocol aims to facilitate access to oral language, participation and school inclusion for children with hearing loss in mainstream classrooms.
- Teacher and family training, together with acoustic ecology strategies, play a key role.
- Se promueve el empoderamiento. The empowerment of the child and their environment is encouraged.

Limitations

- Its implementation depends on the availability and coordination of specialised human resources.
- The viability and validity of the protocol have not yet been empirically established.

Perspectives

- Other context and educative levels.
- It facilitates systematic and multidisciplinary intervention from an early age.
- It can serve as a model for future inclusive education policies in Spain and other Spanish-speaking countries.

Considerations

- It is considered important to conduct periodic assessments to adapt the protocol to each child.
- The need for ongoing awareness-raising within the entire educational community is highlighted.
- It is essential to foster institutional commitment to ensure ongoing training and access to technological resources.

school environment for students with hearing loss. As a result, a proposed school-based protocol is presented to train teachers, students and families about the educational, technological and psychosocial needs of children with hearing loss. In future studies, it is planned to evaluate the efficacy of the protocol through

indicators of participation, academic performance and socio-emotional well-being.

Keywords

Remote microphones, inclusion, noisy environment, language, auditory fatigue.

Introduction

Newborn hearing screening has enabled early detection of hearing loss, which, together with technological advances, has facilitated the development of language similar to that of hearing children in many children with hearing loss (Manrique et al., 2004; Monsalve González & Núñez Batalla, 2006). This early development of oral communication allows children with hearing loss to access mainstream schooling (Núñez et al., 2022; Trinidad & Jáudenes, 2011). It is estimated that, in Spain, more than 95% of children with hearing loss are enrolled in this type of school (Consejo Escolar del Estado, 2025). Despite this, these students continue to face major challenges in everyday listening environments, such as a classroom, due to their difficulty understanding spoken language in noisy, reverberant environments, as well as when there is distance between the speaker (i.e., the teacher) and the listener (i.e., the child with hearing loss; Bagatto, 2020; Leines et al., 2022; Lieu et al., 2020; McCreery et al., 2019).

Problems accessing oral language in noisy environments limit the learning and academic outcomes of children with hearing loss (e.g., Vázquez Mosquera, 2021). Furthermore, challenging listening situations increase the student's listening effort (Picou et al., 2013), which leads to auditory fatigue, and consequently inattention and, at times, social isolation in the school environment (Hornsby et al., 2022; McGarrigle et al., 2019). Communication difficulties in these environments cause children with hearing loss to be perceived as different or less capable, making them more vulnerable to bullying (Del Carmen Morán-Avilés & Pallaroso-Granizo, 2024; Genç et al., 2023). Therefore, the educational process for these children remains complex and presents obstacles that must be addressed to ensure better academic outcomes and school inclusion (e.g., Maggio De Maggi & Calvo, 2021).

To alleviate these difficulties and facilitate access to oral language, the use of assistive technology systems

is recommended, such as frequency modulation systems or modern remote microphones (Benítez-Barrera & Olleta, 2024; Olleta, 2018). This technology eliminates the negative effects of distance and background noise on the speech signal through a personal microphone worn by the teacher, which is connected to the hearing device of the student with disability (Benítez-Barrera & Olleta, 2024). Other important measures include reducing ambient noise, for example through sound-absorbing panels, or providing a preferential seat in the classroom so that the student is always positioned close to the teacher, among others (Crandell & Smaldino, 2000; Werfel & Hendricks, 2023).

Despite the implementation of these personal and technological measures, students with hearing loss do not always achieve full inclusion in the mainstream school environment (Dockrell et al., 2004; Gheller et al., 2020; Gheller et al., 2023). This is sometimes due to the lack of training and knowledge among teaching staff about the special needs of students with hearing loss described above (Dockrell et al., 2004). For example, although 84% of children with hearing loss use assistive technology in the classroom, 30% still repeat a school year at least once during their educational trajectory (Fiapas, 2019).

In addition to purely academic difficulties, children with hearing loss show socio-affective and inclusion difficulties in mainstream classrooms (e.g., Calderon & Greenberg, 2010). These difficulties may manifest as low self-esteem, limited participation in group dynamics and difficulty establishing relationships with hearing peers. Barriers in everyday communication can affect both their sense of belonging and their emotional development, underscoring the need for interventions that address not only access to the curriculum but also the relational and emotional dimensions of the school experience (Alegre de la Rosa & Vilar Angulo, 2019; Constantinescu-Sharpe et al., 2017; Dalton, 2013; Eriks-Brophy et al., 2006; Martin et al., 2011).

In Spain and other Spanish-speaking countries, educational staff generally do not receive specific training in hearing loss. Furthermore, there is no professional role of educational audiologist, nor, in its absence, practical tools to guide the work of teaching staff in appropriately supporting students with this disability. Therefore, resources are needed to train and guide teachers in the speech-language, hearing-device-related, acoustic and socio-emotional aspects of students with hearing loss in order to facilitate their inclusion in school settings (Keith & Ross, 1998; Mapolisa & Tshabalala, 2013; Prakash, 2012). The aim of this study was to develop, through a literature review and consultation with an expert committee, a proposed intervention protocol that can be implemented in mainstream schools focused on improving access to oral language and promoting inclusion of students with hearing loss. The ultimate goal of such a protocol is to promote improved academic outcomes and socio-affective well-being for students with hearing loss, fostering full inclusion in the educational environment. This is an initial proposal that will need to be tested and empirically evaluated, in order to be adjusted or modified according to its efficacy and viability in different educational contexts. Future studies should focus on validating its impact on teaching practice and on the communicative and academic outcomes of students with hearing loss.

Methods

The protocol focuses on students in pre-school education and the first cycle of primary education. This period corresponds to the first years of schooling and is therefore vital for an adequate and successful education. At this stage, oral language development is particularly intense and the school environment tends to present unfavorable acoustic conditions (Astolfi et al., 2019; McKellin et al., 2011; Minelli et al., 2022), and therefore a support protocol may be particularly effective in facilitating communication and learning in children with hearing loss at these ages.

The protocol was developed through a review of the existing literature, including research on hearing loss and academic inclusion (Alegre de la Rosa & Villar Angulo, 2019; Constantinescu-Sharpe et al., 2017; Dalton, 2013; Eriks-Brophy et al., 2006), as well as the governmental recommendations in Spain on the inclusion of students with hearing loss in the

school environment (Gobierno de España, 2023). This review made it possible to identify previously documented good practices and, at the same time, detect specific educational needs. This structure served as the basis for the design of the protocol phases proposed below. Subsequently, an expert committee was formed consisting of four professionals (three of them authors of the present study) with extensive clinical experience in pre-school education, audiology and pediatric speech-language therapy, all of them linked to the field of early intervention and educational intervention for children with hearing loss. The committee met regularly over a period of four months, through fortnightly working sessions, with the aim of reviewing, discussing and reaching consensus on the content of the protocol. Sessions were organized around the previously identified areas and included phases of critical review, contributions based on professional experience and validation of the proposed recommendations.

To ensure the traceability of the process and the internal coherence of the protocol, detailed minutes of each session were produced and a validation matrix was used to organize and classify the committee's suggestions and observations. This matrix enabled the agreements reached to be documented, the decisions made to be justified and the changes incorporated throughout the development process to be systematized. In this way, a participatory, structured approach grounded in clinical experience and the available evidence was ensured.

Results

Following the implementation of the methodology, the expert committee identified four key actors in the inclusion of students with hearing loss that needed to be addressed in the intervention in the mainstream classroom: teaching staff, families, students with hearing loss and hearing peers. To address these areas of action, an operational strategy was designed comprising four intervention phases, each designed to provide targeted training for one of these groups. It was also determined that the protocol should be implemented in a multidisciplinary manner, involving academic tutors and inclusion support specialists such as therapeutic pedagogues, counsellors, etc., under the coordination of the hearing and language teacher at the school. This organization allows the protocol to

be applied progressively and systematically, facilitating its integration into the school context.

Table 1 details the steps and objectives of each phase, as well as the workshops to be conducted to achieve them. Furthermore, the Appendix expands on this information by detailing objectives, steps, instructions, duration, materials to be used and location for each workshop. A real case is also provided to illustrate the implementation of the protocol. As described in Table 1 and the Appendix, the first phase includes training and advisory actions for teaching

and guidance staff, which must be carried out by the hearing and language teacher, together with the external speech-language therapist and/or audiologist, during the first month of the school year. This training focuses on the knowledge of the different types of hearing loss and their implications, hearing device and technological treatments, the different communication modalities and optimization of language access in the classroom. After receiving the training, teachers are responsible for implementing these measures in the classroom.

Table 1. Action plan at school

Action	Objective(s)	Activities
<i>Phase 1 (Teachers)</i>		
Knowledge on hearing loss	- To provide teaching staff with the necessary knowledge to fully understand the needs of the student with hearing loss. - To provide the teaching staff with all the available information about their students with hearing loss.	- Workshop (Workshop 1*) about childhood hearing loss include: - Hearing loss and its consequences. - consequences - Handling of hearing devices, batteries, chargers. - Use of remote microphones and other assistive technology systems. - Bimodal language and lip-reading. - Simulation of hearing loss and its consequences. - Designation of a maintenance and equipment charging manager. Collection of the student's clinical history and discussion with teaching staff.
Communicative strategies in the classroom	- advise teaching staff on communicative strategies that promote the inclusion of the student with hearing loss. - To identify activities that facilitate or hinder the participation of said students. - To promote the use of visual supports, clear communication structures and turn-taking regulation techniques.	- Workshop (Workshop 2) on communicative strategies that promote language access for children with hearing loss: - Analysis of activities according to their degree of communicative accessibility. - Recommendations to promote communication with the student with hearing loss. - Collaborative creation of communication and visual support strategies. - Training activities for turn-taking regulation.
Improvement of classroom acoustics	To minimize noise and reverberation in the classroom to facilitate speech comprehension.	Workshop (Workshop 3*) on classroom acoustics.
<i>Phase 2 (Family)</i>		
Family training	- To provide the family with the necessary knowledge and resources that allow them to advocate for their child's needs in the school environment. - Empower the school's environment.	- Adapted children's workshop - To inform the family about specific strategies and techniques that facilitate the teaching-learning process and social and personal development of the child with hearing loss. - Guidance on support and schooling for the child with hearing loss. - Information on the adverse consequences of noise, distance and reverberation on the child's language development, socialization and auditory fatigue, and the measures that have been or will be implemented in the classroom to mitigate them. - Scheduling of a quarterly meeting between teachers and family to monitor the child's progress.

Action	Objective(s)	Activities
Family participation at school	• To improve the academic and inclusive outcomes of the student with hearing loss through shared educational responsibility.	• Workshop (Workshop 5*) to promote family participation at school: - The family, with the support of the tutor and/or the hearing and language teacher, introduces the child with hearing loss and their needs to the rest of the class. - The family advocates for their child's peers to be aware of the importance of the sense of hearing.
<i>Phase 3 (Students)</i>		
Support for the child in their communicative development	• For the child to learn communication strategies that allow them to interact with their peers effectively. • To enable the child to advocate for their rights and needs. • To support and assist the student with hearing loss in their communication and participation.	• Workshop (Workshop 6*) aimed at working on communicative strategies with the child with hearing loss in the classroom: - Development of communicative strategies like asking for clarification. - Promotion of conversational self-regulation and active participation in interactions.
Raising student awareness about the needs of the child with hearing loss	• To inform students about hearing loss and the technical and communicative needs of their peer. • To support and assist the student with hearing loss in their communication and participation in the classroom. • To foster an inclusive classroom environment towards the child with hearing loss.	• Workshop (Workshop 7*) aimed at creating an environment where the hearing student develops a communicative culture that promotes the inclusion of the child with hearing loss: - Auditory simulation through oral instructions with and without earplugs, to raise students' awareness of the communicative barriers faced by their peer with hearing loss. - Reading of the story "Leo and his hearing aids" and subsequent discussion to promote empathy, understanding and participation of the student with hearing loss. - Implementation of the "travelling book" as a bridge between school and family, fostering awareness in the home environment.
<i>Phase 4 (Evaluation)</i>		
Monitoring of the implementation of measures	• Ensure that the measures described in the following phases are implemented on an ongoing basis. • To ensure that the measures promote the development and well-being of the child with hearing loss.	• Carry out the following evaluations*: - Noise measurements in the classroom before and after the implementation of acoustic measures in the first month of the school year. Thereafter, at least once a month in the occupied classroom to ensure noise levels remain stable. - Evaluation at the beginning of the school year and every three months. - School Hearing Questionnaire at the beginning of the school year, to be reviewed quarterly. - Language tests (TVIP, ITPA, PROLEC-R, TALE) at the beginning and the end of the school year. - Social participation in the SENA questionnaire once every three months. - Record turn-taking compliance in the classroom once a month.

* All workshops and the evaluation phase are developed in detail in the Appendix. A practical demonstration case is also included.

The second phase focuses on the family, who receive training on hearing loss and the educational environment from the hearing and language teacher and/or other professionals working with the child. This training provides the family with tools to advocate for their child's needs throughout their schooling (Cruz-Iglesias et al., 2025; Olleta, 2018). It also ensures the promotion of shared educational responsibility

and collaboration with teaching staff to optimize the child's educational outcomes (Dalmau-Montala et al., 2017). This phase should be completed during the first eight weeks of the school year.

The third phase combines inclusive actions for all students with specific interventions for students with hearing loss, in order to create a favorable communicative environment and promote their psychosocial

inclusion. Through workshops, communication skills, self-advocacy and self-esteem are strengthened, which promotes active participation and sustained inclusion throughout their schooling (Eriks-Brophy et al., 2006; Furrer & Skinner, 2003). Ideally, this phase should be completed in the first term of the school year.

The fourth phase focuses on the ongoing evaluation of the intervention protocol, with the aim of ensuring its effectiveness and adapting it to the changing needs of students with hearing loss. These evaluations, carried out throughout the school year by teaching staff with family authorization, include review of the acoustic conditions of the classroom, compliance with communicative aids and the level of auditory fatigue in students with hearing loss, assessed using the Vanderbilt Pediatric Fatigue Scale (Hornsby et al., 2022). Additionally, the School Hearing Questionnaire from the Phonak Children's Program (Maggio De Maggi, 2004) is used to assess the usefulness of the remote microphone system in students' audibility and detect possible barriers to their participation. Additionally, specific tools will be incorporated to assess social participation, such as the Child and Adolescent Assessment System (SENA), which evaluates emotional and social adjustment, including relationships and school adaptation (Sánchez-Sánchez et al., 2016). Finally, assessments of vocabulary, language, literacy and communicative development will be carried out with the aim of monitoring each child's linguistic development and ensuring adequate progress throughout the school year. These assessments are part of the general monitoring of students and, although they do not allow a direct causal relationship with the implementation of this protocol to be established, they do provide valuable information about the evolution of linguistic development in an inclusive context, as well as, indirectly, about academic performance. The tools used include the Test de Vocabulario en Imágenes de Peabody (TVIP; Dunn, 1997), the Test Illinois de Aptitudes Psicolingüísticas (ITPA; Kirk, 2011), the Batería de Evaluación de los Procesos Lectores (PROLEC-R; Cuetos et al., 2007) and the Test de Análisis de Lectoescritura (TALE; Toro et al., 2015). Language assessments will be conducted at different points during the school year, depending on the test (see Appendix). Parents will be informed of the results at all times.¹

¹ These tests have been validated with child population in Spain. Therefore, in contexts where other Spanish variety is spoken, it is recommended to assume that these tests are validated or to use equivalent tests that have been validated with that population.

Discussion

An intervention protocol proposal has been developed aimed at promoting the inclusion of pre-school and primary education students with hearing loss in the mainstream educational system. This easily implemented protocol aims to improve access to oral language through specific strategies that promote pupil participation, optimize access to academic content and help reduce auditory fatigue (Davis et al., 2021; Gustafson et al., 2021). There are protocols or guidelines available to promote the inclusion of students with disability in general in mainstream classrooms, such as the Protocol for the Care of Students with Disabilities in the Educational Field of CERMI-CV (CERMI Comunidad Valenciana, 2019). This type of protocol can be helpful for the inclusion of children with hearing loss, but lacks the specificity needed to address the hearing and communicative needs particular to students with hearing loss. This is one of the main strengths of our protocol, which is grounded in a comprehensive review of the literature on acoustic ecology, inclusive education and the use of assistive technologies, as well as a consensus process with a committee of clinical experts in pre-school education, audiology and pediatric speech-language therapy. Based on this work, a structured set of concrete, adaptable, evidence-based actions is proposed, specifically aimed at improving access to oral language, classroom participation and the well-being of students with hearing loss.

An essential component of this protocol is its comprehensive approach, encompassing all the agents involved in inclusion: teaching staff, students with and without hearing loss, and families. This contrasts with other recommendations that focus exclusively on technical-acoustic aspects (Chute & Nevins, 2009; Dodd-Murphy & Mamlin, 2002). A coordinated and progressive approach is proposed that seeks to foster an inclusive culture from the earliest educational stages. In this regard, the protocol stands out for its applicability in real-world contexts, even with limited resources, and for its potential to adapt to different levels of institutional engagement.

During the design of the protocol, various challenges arose, including the need to agree on strategies that were both rigorous and realistic for implementation in classrooms with high teaching loads and suboptimal acoustic conditions. Recent literature has highlighted the negative influence that noise in

pre-school classrooms can have on well-being, language access, auditory fatigue and pupil concentration (Astolfi et al., 2019; McKellin et al., 2011; Minelli et al., 2022). In this context, the protocol proposes practical actions aimed at improving speech intelligibility and mitigating the effects of noise, following recommendations from recent studies on the use of hearing aids such as remote microphones at early ages (Cooper et al., 2025). This point is particularly relevant, given that, although the use of remote microphones is not fully implemented in classrooms, with their use being discouraged at preschool age, this practice is not supported by a solid empirical basis. On the contrary, current evidence supports their systematic use in all children with hearing loss of preschool age, provided that adequate fitting of the system and support from educational and clinical professionals is guaranteed (e.g., Walker et al., 2019).

The protocol also promotes the empowerment of students with hearing loss, developing their skills to recognize their own communicative needs and autonomy from an early age (Fredricks et al., 2019; Tzovara et al., 2021). Self-efficacy in noisy contexts, as well as the ability to request repetitions or communicate specific needs, are key competencies for their long-term academic and social development (Fredricks et al., 2019; Huyck et al., 2021). These skills become even more relevant considering that other school contexts, such as the canteen or playground, do not always guarantee adequate acoustics, and in which the use of remote microphones tends to be more difficult to implement (McKellin et al., 2011). This capacity for self-efficacy is crucial in later stages such as primary, secondary and university education or the workplace, where they will face communicative challenges in more complex environments with less support. Developing these skills from childhood not only improves academic access and socialization, but also provides students with hearing loss with tools to function independently and defend their right to effective communication in any context (Huyck et al., 2021; Oswald & Ostojic, 2020; Tzovara et al., 2021). Likewise, the training and awareness-raising of students without hearing loss constitutes an essential aspect of the protocol. Promoting knowledge about hearing devices, encouraging cooperative attitudes and fostering inclusive practices are elements that contribute significantly to making diversity visible and building fairer school environments, in this case, for peers with hearing loss (Tzovara et al., 2021).

Simultaneously, the fundamental role of families as active agents in the educational process is recognized, so the protocol proposes specific actions that enable them to collaborate effectively with teaching teams and advocate for the rights of their children (Eriks-Brophy et al., 2006). Family empowerment involves knowing the educational and accessibility rights of students, communicating effectively with teachers and therapists, and being prepared to request resources or adaptations when necessary (Cruz-Iglesias et al., 2025). A well-informed family will be able to demand periodic hearing assessments, ensure that teachers are trained in the use of devices and advocate for the implementation of acoustic ecology strategies in the classroom (Crandell & Smaldino, 2000; Rekkedal, 2015). These actions can ensure that, over time, the students' needs are met. An empowered family is essential for achieving full inclusion.

Despite the potential of this proposal, it is important to recognize the limitations of the present study. The protocol constitutes a preliminary tool based on theoretical evidence and expert consensus, but has not yet been subjected to a systematic process of empirical validation. Future studies will be needed to evaluate its efficacy through the establishment of clear, measurable and quantifiable objectives, both in terms of academic and socio-emotional outcomes for students with hearing loss. This research should consider the implementation of the protocol in different educational contexts, with variability in available resources, teacher training and degree of institutional commitment, in order to assess its viability, adaptability and real impact. Furthermore, it would be advisable to evaluate whether the knowledge acquired by all agents involved (teaching staff, students and families) carries over to subsequent school years, also assessing the impact of protocol implementation in pre-school education on the well-being and academic performance of students with hearing loss as they progress through their schooling. Ongoing reflection on these elements will be key to ensuring the sustainability and usefulness of the protocol in real educational settings.

Conclusions

This study presents a proposed intervention protocol aimed at improving the inclusion of students with hearing loss in the initial stages of schooling. The protocol, structured in four phases, specifically

addresses the main agents of the school environment, promoting access to oral language, participation and the socio-emotional development of students. Its design is based on a rigorous literature review and the consensus of an expert committee in pre-school education, audiology and pediatric speech-language therapy. Although it is a preliminary tool, it is proposed as an easily implementable resource that can be adapted to different school contexts. Future research should empirically validate its impact and sustainability, and evaluate its medium- and long-term effect on the educational and personal trajectory of students with hearing loss.

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APPENDIX

Phase 1

Workshop 1: General training on hearing loss for teachers

Objective(s)

- Provide teaching staff with the necessary knowledge to fully understand the needs of the student(s) with hearing loss.
- To provide teaching staff with all available information about the student(s) with hearing loss.

When?

- During the first month of the school year.

Duration

- 90 minutes with a 10-minute break.

Who carries out the workshop?

- Hearing and speech teacher, pediatric audiologist, speech-language therapist or any professional with expertise in hearing impairment.

Attendees

- Teaching staff working in the classroom with the child with hearing loss.
- School support group.

Location

- Classroom assigned to the student with hearing loss or any space with an interactive whiteboard or room with a screen.

Content

- About hearing loss and its consequences.
- Handling of hearing devices, batteries, chargers.
- Use of remote microphones and other assistive technology systems.
- Bimodal language and lip-reading.
- Simulation of hearing loss and its consequences.
- Effective inclusive communication strategies.

Materials

- PowerPoint presentation, educational videos, graphic material of the auditory system, demonstration material for hearing aids, bone-anchored implants, cochlear implants and remote microphones.

How to conduct the activity?

The information will be provided by means of a PowerPoint presentation, supported by available graphic and physical material. This general information on hearing loss will help to understand the general implications of hearing loss in children and how to use strategies to communicate effectively with them. The need for the use of remote microphones to improve comprehension in the classroom will be emphasized and a practical session on their use, maintenance and charging will be conducted. A person responsible for this maintenance and charging will be designated from among the workshop participants. The final 40 minutes will be devoted to presenting the information provided by the family together with both medical and educational assessments, in order to understand the difficulties, needs and possibilities of the student and to practice the specific strategies and techniques that facilitate the learning process and personal and social development of the student with hearing loss. The best seating position for the student with hearing loss in the classroom will also be discussed.

Workshop 2: Communicative strategies in the classroom

Objective(s)

- To advise teaching staff on communicative strategies that promote the inclusion of the student with hearing loss.
- To identify classroom activities that facilitate or hinder the participation of said students.
- To promote the use of visual supports, clear communication structures and turn-taking regulation techniques.

When?

- During the first weeks of the school year, ideally within the first month.

Duration

- 75 minutes.

Who carries out the workshop?

- Hearing and Language teacher, speech-language therapist, or audiologist.

Attendees

- All teaching and support staff who interact with the student with hearing loss.

Location

- Meeting room or training room of the school.

Content

- Analysis of classroom activities according to their degree of communicative accessibility.
- Recommendations to promote communication with the student with hearing loss.
- Collaborative creation of communication and visual support strategies.
- Training activities for turn-taking regulation.

Materials

- List of examples of inclusive and exclusive activities.
- Pictograms, sign language cards, examples of visual aid.
- Toy microphone.
- Observation sheets for recording turn-taking.
- Blackboard, highlighters.

How to conduct the activity?

The session begins with a brief overview of hearing impairment and its impact on students' participation in the classroom. It then presents specific examples of school activities that can either facilitate or hinder inclusion, such as small group work with visual supports and guided instructions, compared to debates or large group discussions without turn-taking control or visual supports. The teaching group is invited to reflect collectively on how to adapt routine activities to make them more accessible and equitable for students with hearing loss.

Subsequently, the design and rehearsal of communicative approaches that promote interaction with these students is undertaken, such as speaking to them face-to-face, in a slow and clear manner, using visual supports, pictograms or bimodal language, and ensuring they are positioned in a visually strategic location. There will also be a simulation exercise in which teachers practice managing turn-taking using a toy microphone, emphasizing the importance of all students learning to wait for their turn to speak. Finally, it is suggested that an observation sheet be used so that, each week, a different pupil can record how well students take turns to speak in class, thereby promoting self-regulation and group awareness.

The session ends with an open space for questions, discussion of specific cases and the formulation of individual and collective commitments to

implement the proposed strategies in the real classroom context.

Workshop 3: Improvement of classroom acoustics

Objective(s)

- To minimize noise and reverberation in the classroom to facilitate speech comprehension.

When?

- During the first month of the school year.

Duration

- 60 minutes

Who carries out the workshop?

- Hearing and speech teacher, pediatric audiologist, speech-language therapist or any professional with expertise in hearing impairment.

Attendees

- Teaching staff working in the classroom with the child with hearing loss.
- School's support group.

Location

- Classroom assigned to the hearing loss child.

Content

- Consequences
- Protocol on how to reduce noises in the classroom such as:
 - Fitting tennis balls to the legs of tables and chairs.
 - Installing panels or murals made of sound-absorbing materials on the walls.
 - Delimiting activity areas in the classroom using rugs, cork or rubber mats.
 - Use of silent sources of light.
- Measurement of the noise level in the empty classroom and recording with a sound level meter or mobile application.
- Measurement of the noise level in the classroom during school hours with a sound level meter or mobile application.
- After the workshop, teachers will be encouraged to implement the measures learned and another measurement of noise levels in the occupied and unoccupied classroom will be carried out.

Materials

- PowerPoint presentation, tennis/padel balls, panels and murals for the walls, cork, felt, rubber, rugs and silent spotlights., Sound level meter or mobile application to measure reverberation.

How to conduct the activity?

The first part of the workshop consists of a 45-minute presentation reflecting on the harmful effects of noise on learning and possible measures to mitigate it in the classroom. Next, a noise measurement is taken in the unoccupied classroom with a sound level meter or mobile application. The day after the workshop, noise levels are measured in the occupied classroom and teachers and support staff are encouraged to implement the measures learned in the following weeks. Once these measures have been applied, noise measurements are taken again in the occupied classroom to evaluate whether the measures have been effective.

Phase 2

Workshop 4: Family training

Objective(s)

- Provide families with the knowledge and resources they need to advocate for their child's needs within the school environment.
- Empower families in their role within the school environment.
- Scheduling of a quarterly meeting between teachers and family to monitor the child's progress.

When?

- During the first family tutoring of the year, ideally during the first few weeks of the school year, but only once the teachers have received the relevant training in Workshops 1-3.

Duration

- 60 minutes.

Who carries out the workshop?

- Tutor of the child with hearing loss and hearing teacher.

Attendees

- Tutor, hearing teacher and family.

Location

- Classroom assigned to the child with hearing loss.

Content

- Information for the family on the specific strategies and techniques that facilitate the teaching-learning process and social and personal development of the child with hearing loss.
- Guidance on support and schooling for the child with hearing loss.
- Information on the adverse consequences of noise, distance and reverberation on the child's language development, socialization and auditory fatigue, and the measures that have been or will be implemented in the classroom to mitigate them.
- Scheduling of a quarterly meeting between teachers and family to monitor the child's progress.

Materials

PHONAK parent guides (<https://www.phonak-pip.es/para-padres/guias-recursos/>). Videos on barriers in the school environment from FIAPAS (<https://www.youtube.com/channel/UCupCyiL7iwuXPcxEhtcl38A/videos>), telephone contacts and emails of professionals and external associations.

How to conduct the activity

The tutor and the hearing and language teacher already know the most relevant information about the child thanks to Workshops 1 and 2, and together with the educational guidance team, will have decided on the most appropriate individual educational strategies for the child. In this workshop, families will be informed of the measures to be developed, including the classroom acoustic improvement measures and why. The family will also be informed about the usefulness of the remote microphones and when they will be used. This workshop should also coordinate with the family the maintenance of the child's hearing devices, authorizing (or not) the teaching staff to handle them. Finally, the family will be invited to a new meeting (at the end of the term) to assess their child's progress.

Family participation at school

Objective(s)

- To improve the academic and inclusive outcomes of the student with hearing loss through shared educational responsibility.

When?

- After the first tutorial. Preferably within the first eight weeks of the school year.

Duration

- 60 minutes.

Who carries out the workshop?

- Family of the child with hearing loss with the support of the tutor and/or the hearing and language teacher.

Attendees

- Family, child with hearing loss, child's peers, tutor, hearing and language teacher.

Location

- Classroom of the child with hearing loss.

Content

- The family, with the support of the tutor and/or the hearing and language teacher, introduces the child with hearing loss and their needs to the rest of the class.
- The family advocates for their child's peers to be aware of the importance of the sense of hearing.

Materials

- PowerPoint presentation, remote microphone, model and poster of the ear and its parts; paper, pencil and paints to produce a drawing on "What is my favorite sound?"

How to conduct the activity

The activity will be carried out by the family. The hearing and language teacher will assist them with the PowerPoint presentation and provide guidelines. The presentation will be divided into three parts: the first will explain what the ear is and how there are "magic devices" to help hearing. The second part will focus on their child's hearing history, what their device is like and how they are able to communicate thanks to it. The third part will involve showing the remote microphone, "their spy device", which can pick up anything the teacher says even when not present. The presentation will mention some famous figures with hearing loss. All students will be asked if they know people who do not hear well, and all questions they ask about the presentation will be answered. To close the activity, all students, including the child with hearing loss, will be asked to make a drawing about their favorite sound. They will start the drawing in the workshop and finish it at home. They should bring it the following week. All drawings will be displayed in a visible area of the school. Organizing a competition for the best drawing about a favorite sound is optional.

Phase 3

Workshop 6: Support for the child with hearing loss in their communicative development

Objective(s)

- For the child to learn communication strategies that allow them to interact with their peers effectively.
- To enable the child to advocate for their communicative rights and needs.
- To support and assist the student with hearing loss in their communication and participation.

When?

- This workshop will preferably be conducted within the first term of schooling, and always after Workshop 4.

Duration

- 60 minutes.

Who carries out the workshop?

- Tutor with the support of the hearing and language teacher and the therapeutic pedagogue.

Attendees

- Hearing loss student and hearing peers from his classroom.

Location

- Classroom assigned to the hearing loss child.

Content

- Developing communication strategies such as asking for clarification, repetition or visual aids when a message is not understood.
- Promotion of conversational self-regulation and active participation in interactions.

Materials

- Sheets with the chosen semantic fields, whiteboard and chalk.

How to conduct the activities

At the start of the workshop, the tutor explains to the group that they will play two games with the aim of improving communication among all classmates. In the first activity, called "Guessing words by lip reading", different semantic fields (such as fruits, colors, numbers or means of transport) will have

been previously worked on in small groups, reinforcing each word with its corresponding image. Once students are familiar with the vocabulary, the tutor, facing the group, will silently mouth a word without making a sound, and students must identify it by lip reading. This activity allows everyone to experience the difficulties associated with communication without auditory support, fostering empathy and group awareness.

The second activity is called “The color game”. Each student receives five cards of different colors (red, yellow, green, blue, orange and pink), which they place on their desks. The tutor will stand facing the group, ensuring that their face is fully visible to facilitate lip reading. They will then mouth one of the colors without making a sound. Students who manage to identify the color will hold up the corresponding card. If they do not understand the word, students may request help by raising their hand in an orderly and silent manner. The tutor will note on the whiteboard the correct answers obtained by each participant.

At the end of the activities, the tutor will reinforce with the group some key ideas related to effective and inclusive communication. As a group, and subsequently also individually with the student with hearing loss, the importance of speaking face-to-face to facilitate comprehension will be highlighted, as well as the fact that it is not necessary to raise one's voice or shout to be understood. It will also be emphasized that asking for help or clarification when a message has not been understood is not only valid but necessary for effective communication. The fundamental role of good visual communication and the appropriate use of hearing devices in the daily life of the student with hearing loss will also be addressed. If the student's language level allows, they will be encouraged to express these ideas to the group, thereby promoting their self-esteem and self-efficacy.

Reinforcement: The child or children who have guessed the most words will receive a certificate (optional).

Instructions: Activity instructions will be provided to the group verbally and directly, using clear and accessible language. To ensure full comprehension by the student with hearing loss, these instructions will be reinforced individually, verifying that they have correctly understood what is expected of them during the workshop.

Workshop 7: Raising hearing students' awareness of the needs of the child with hearing loss

Objective(s)

- To inform students about hearing loss and the technical and communicative needs of their peer.
- To support and assist the student with hearing loss in their communication and participation.
- To foster an inclusive classroom environment towards the child with hearing loss.

When?

- This workshop consists of two activities to be implemented during the first school term in one or two sessions in parallel with Workshops 5 and 7.

Duration

- 90 minutes.

Who carries out the workshop?

- Hearing and language teacher, tutor, support team.

Attendees

- All students.

Location

- Classroom assigned to student with hearing loss.

Content

- Auditory simulation through oral instructions with and without earplugs, to raise students' awareness of the communicative barriers faced by their peer with hearing loss.
- Reading of the story “Leo and his hearing aids” and subsequent discussion to promote empathy, understanding and participation of the student with hearing loss.
- Implementation of the “travelling book” as a bridge between school and family, fostering awareness in the home environment.

Materials

- Children's foam earplugs, children's drawings, dictation sentence material adapted to the age of the students, paint and pencil.
- Children's book Leo and his Hearing Aids.

How to conduct the activities

The first workshop activity aims to help students experience how the sound environment of the classroom

can influence the comprehension of oral language, and how the use of assistive technologies, such as the remote microphone, directly benefits their peer with hearing loss. To do so, each student receives a children's drawing and paints (or sentences are dictated for them to copy, depending on age). The tutor stands with their back to the group, facing the whiteboard, and begins giving oral instructions quietly, for example: "Paint the flower yellow" or "Color a shoe on the clown blue". Meanwhile, the student with hearing loss remains connected to their remote microphone and can follow the instructions clearly. The hearing and language teacher supervises that the device connection is working correctly.

After completing the first round, the same activity is repeated, but this time the hearing students use foam earplugs in their ears to simulate a hearing loss. At the end, the results of both exercises (drawings or sentences) are compared and a joint reflection is conducted on the differences observed. This activity allows students to understand the barriers faced by people with hearing difficulties, valuing the importance of maintaining silence, respecting turn-taking and making appropriate use of technical supports such as remote microphones.

The second workshop activity consists of a group reading of the story Leo and his Hearing Aids (<https://www.phonak-pip.es/para-padres/guias-recursos/>). All students sit in a circle in a comfortable space, while the tutor, connected to the remote microphone, reads the story aloud. The student with hearing loss sits near the tutor, ensuring correct hearing through their device. During the reading, students' comprehension is indirectly verified and, at the end, a space is opened for them to ask questions both about the story and about the personal experience of their peer with hearing loss.

Depending on the child's communicative abilities, these questions may be answered directly by them or with the support of their family, who may also be present and use the transmitter microphone if necessary. As a complement, a former student with hearing loss (or a current older student) can be invited to share their personal experience with the group, thus promoting positive role models and fostering inclusion. Furthermore, the story can become a "travelling book": the tutor prepares a lending list so that classmates take the book home and read it as a family. This allows families to also raise awareness and better understand the reality of the child with hearing loss.

Workshop 8: Support for the child with hearing loss in their psychosocial development

Objective(s)

- To promote communication, interaction and socialization of the child with other children with hearing loss to support the development of their identity.

When?

- During the first term of the child's schooling, in parallel with Workshops 5 and 6.

Duration

- 60 minutes.

Who carries out the workshop?

- Speech-language therapist and/or early stimulation specialist of the child with hearing loss.

Attendees

- Child with hearing loss, some classmates, and other children with hearing loss.

Location

- Association for children with hearing loss, rehabilitation center, audiological clinic or similar.

Content

- Games adapted to the interests of the students, thematic images, pictograms, attractive visual materials, and any resource that facilitates conversation and cooperative play.

Materials

- Puppets, dolls, character cards, thematic sheets, simple costumes.
- Pictograms or visual support cards, if necessary.
- A play mat or designated play area.
- Box or "interests suitcase" with thematic items (animals, superheroes, dinosaurs, etc.).

Content

- Free and spontaneous play in a small group using thematic materials selected according to the children's interests (dolls, sheets, costumes, etc.), promoting natural peer interaction among children with hearing loss.
- Support for functional communication through gentle adult interventions: turn-taking, expression of ideas, requesting help and use of visual supports if necessary.

- Emotional support and positive reinforcement to build self-esteem and a sense of belonging.
- Involving families as active participants in the process, encouraging the continuation of social interactions outside the school environment.

How to conduct the workshop

The activity is conceived as a small-group thematic play club. The speech-language therapist and/or early stimulation specialist prepares in advance a suitcase or box with items related to topics of interest (for example: zoo animals, film characters, dinosaurs, robots, etc.). The selection of materials can be made in advance by asking families about their children's preferences or even involving the child in their preparation. At the start of the session, the teacher invites the children to explore the contents of the box/toy chest and decide together what to play. A structured game is not led; rather, children are encouraged to invent rules, create stories or share objects freely, with the discreet guidance of the adult to facilitate interaction, promote the expression of ideas, turn-taking, requests for help and respect for each other's emotions.

During the session, communicative formulas such as "could you pass it to me, please?", "I don't understand", "it's your turn" can be gently introduced, always with visual supports if needed. The important thing is to create a playful, relaxed and connected atmosphere where the child with hearing loss can identify with others, feel understood and belong to a group. At the end, the children are invited to share through drawings or gestures what they enjoyed most about the game. Families are encouraged to ask at home about what they did, thereby reinforcing the link between the emotional, social and communicative dimensions.

If there is rapport between children and families, a subsequent social activity can be suggested (a games afternoon between families, a video call to continue playing with a friend, etc.) and even repeating the workshop in later months with the aim of extending these bonds outside the therapeutic context.

Phase 4

Assessment and monitoring of the implementation of measures

Objective(s)

- Ensure that the measures described in the following phases are implemented on an ongoing basis.
- To ensure that the measures promote the development and well-being of the child with hearing loss.

When?

- Noise measurements in the classroom will be taken before and after the acoustic measures are implemented during the first month of the school year. Thereafter, measurements will be taken at least once a month in the occupied classroom to ensure that noise levels remain stable.
- Auditory fatigue assessment using the Vanderbilt scale will be conducted at the beginning of the school year and quarterly.
- The School Hearing Questionnaire will be administered at the beginning of the school year and reviewed quarterly.
- Language tests (TVIP, ITPA, PROLEC-R, TALE) will be administered at the beginning and end of the school year.
- Social participation using the SENA questionnaire will be assessed once per term.
- The record of turn-taking compliance in the classroom will be conducted once a month.

Duration

- Duration will depend on the test applied.

Who carries out the assessment?

The school guidance team and the hearing and language teacher. The tutor will be responsible for recording and evaluating noise levels, as well as recording turn-taking compliance.

Attendees

- Does not apply.

Location

- Noise measurements in the classroom and the rest in assessment rooms.

Materials

- Vanderbilt Pediatric Auditory Fatigue Scale (Hornsby et al., 2022).
- Questionnaire (Maggio de Maggi, 2004).
- Language tests: TVIP, ITPA, PROLEC-R, TALE.
- Social participation questionnaire: SENA.
- Sound level meter or mobile app and classroom noise record.
- Record of turn-taking compliance in the classroom.

How to conduct the evaluation

Instructions and assessments will be given verbally. Individual tests (auditory fatigue, language, school questionnaires and social participation) must be conducted in an environment free from noise and visual distractors. The examiner should stand facing the student when their cooperation is required, to facilitate the use of visual cues and lip-reading. Noise levels and turns in conversation will be recorded within the classroom in natural contexts.

Communication of results

All assessments will require prior authorization from the family. Results will be communicated through school reports and tutorial meetings, thus ensuring family support and understanding.

Case study: Mario, a 6-year-old child with moderate bilateral hearing loss

Mario is a 6-year-old child who was diagnosed with moderate bilateral hearing loss at birth, as he did not pass the newborn hearing screening. From the first months of life, he was fitted with hearing aids and began receiving early intervention outside his local area, at a center specializing in children with hearing loss. There, both he and his family received comprehensive support that included auditory stimulation sessions, speech-language therapy and family guidance.

Thanks to the commitment of his family environment and the constant follow-up by his speech-language therapist at the early intervention center, Mario managed to develop oral communicative skills appropriate for his age, although he continued to require favorable conditions to access language, such as a quiet environment, visual supports and the presence of people trained in adapted communicative strategies.

At the start of his primary stage, his parents, valuing both his good academic results and his good development, decided to enroll him at a larger mainstream school near their town. This decision reflects the desire to offer him new socialization opportunities and greater exposure to broader inclusive contexts. Although enthusiastic, the family also expresses certain concerns: Mario is a new child at the school, and will be the only student with hearing loss in his classroom.

In this new context, the speech-language therapist from the early intervention center where Mario

continues to receive weekly support proposes to the teaching team the implementation of a specific protocol to ensure his educational, social and emotional inclusion. The school, in coordination with the family, early intervention center and the hearing loss association, as well as the audiological center, agrees, before the start of the school year, to carry out this plan.

Phase 1 - Teacher training and environmental adaptation

During the first week of classes, the teachers who interact with Mario attend Workshop 1, a general training session on hearing loss, delivered by the Hearing and Language teacher from the school and the speech-language therapist from the external center and/or hearing device audiologist. The session includes an introduction to the use of hearing devices, demonstrations with the remote microphone, an auditory simulation with earplugs and background noise, and basic strategies to improve communication in the classroom. At the end of the workshop, Mario's specific information is reviewed (medical reports, previous school reports, audiological reports, family observations), and a person responsible for the maintenance of the technical equipment is appointed.

In the second week, the teaching team participates in Workshop 2 on inclusive communicative strategies. They analyze routines that could limit Mario's participation (such as activities without turn-taking control or instructions given without visual support) and propose small, realistic adaptations: speaking face-to-face, using visual cues, allowing pauses for repetition, or establishing visual signals for requesting the floor.

In the third week, Workshop 3 is implemented, focused on improving classroom acoustics. Ambient noise is measured (73 dB on average during group activities) and practical measures are applied: rugs in work areas, rubber balls on chair legs, demarcation of spaces with sound-absorbing materials and review of noisy lighting fixtures. After implementing these measures, a new measurement demonstrates a notable improvement (-8 dB) in the occupied classroom.

Phase 2 - Family participation and empowerment

In the fourth week, Workshop 4 is held, a specific tutorial with Mario's family. The tutor and the hearing and language teacher present all the proposed adaptations and explain how progress will be assessed. The family expresses their expectations and approves the teaching staff handling the devices when necessary. It is also agreed to hold quarterly meetings to review progress.

In the sixth week, the family leads Workshop 5 together with the tutor, presenting Mario's hearing history to his classmates. They explain what hearing aids are, how the remote microphone works and what they can do to communicate better with Mario. The activity culminates with an artistic project: each student must draw their "favorite sound" to display in class. Mario chooses the sound of shower water, which he says calms him.

Phase 3 – Direct intervention with Mario and his group

In week 7, Workshop 6 is carried out, a group intervention within the classroom. The tutor proposes two games to practice communication skills. First, the children must guess words by lip reading. Afterwards, they play to identify colors from non-verbal messages. Mario appears visibly comfortable and, at the end, dares to share with his classmates the importance of asking for help when he does not understand something.

In parallel, during week 8, Workshop 7 on class group awareness is implemented. The hearing students use foam earplugs to simulate a hearing loss while trying to follow verbal instructions. They then read Leo and his Hearing Aids and discuss it. The class starts a "travelling book" that takes the story home to share with the family.

In week 9, Mario participates in a second part of Workshop 7, outside school, at his local association for children with hearing loss. There he meets two other children who also use hearing aids and three of his companions from the early intervention center. They play with animal figures, invent stories and use pictograms to organize their turns. Mario smiles a lot and seems relaxed, and his mum says that that evening he talked non-stop about his new friends. The families agree to organize a picnic in the park the following weekend.

Phase 4 – Ongoing assessment and follow-up

From the start, an assessment routine is established that allows the plan to be adapted according to Mario's needs.

- Noise measurements are taken every month and show that noise levels in the classroom have remained below 65 dB during group activities.
- The auditory fatigue scale (Vanderbilt) is administered each term and reflects adequate fatigue levels, which are reflected in the teacher's positive perception of Mario's ability to follow instructions in class.
- The School Hearing Questionnaire (Phonak) indicates systematic use of the remote microphone by the teaching staff and good usage of it.
- The SENA questionnaire shows that Mario has improved his perception of belonging to the group, and that his classmates also perceive him as an active part of the class.
- The turn-taking record shows that the class has internalized the use of visual signals and that Mario participates in more than half of the group activities without the need for additional support.
- Language tests (such as TVIP and PROLEC-R) reveal significant progress in vocabulary and reading comprehension at the end of the school year.

Ending of the school year

At the end of the school year, the educational team celebrates Mario's achievements, as he has adapted remarkably to his new school. He participates confidently in classroom activities, responds with confidence to the teacher's questions, and has formed genuine friendships with several classmates. His progress is evident not only academically, but also in his emotional well-being and his growing initiative to communicate, ask for help when he needs it and clearly explain his needs to those around him.

During the final quarterly meeting with the family, the tutor, the hearing and language teacher and the guidance team share with satisfaction the results of the assessments applied: improvements in vocabulary and reading comprehension, adequate levels of auditory fatigue and a greater perception of social inclusion, both on Mario's part and that of his classmates. Mario has gradually needed fewer reminders to use communicative strategies; now it is he who reminds others that they must speak to him face-to-face or use the remote microphone if there is a lot of noise in class.

The tutor proposes maintaining support during the next school year, including monitoring the measures implemented and repeating some awareness sessions with new teachers or classmates who join. This continuity will help ensure that the educational environment remains accessible, understanding and stimulating for Mario.

At the same meeting, Mario's mother, visibly moved, thanks the team for their commitment and their willingness to work collaboratively from the outset. She explains that the experience has been so transformative that she wishes to share it with other

families at the beginning of their journey. She offers herself as a resource to support parents.

For Mario, this first year has not only been a stage of adaptation, but also of reaffirmation of his identity as a deaf child. He has learnt that his way of listening, communicating and participating is valid, valuable and possible within an inclusive environment. He has understood that being deaf

does not define him as someone with a deficiency, but as someone with a different — and perfectly legitimate — way of inhabiting language, school and the social world.

In simple words, he has discovered that he can be himself, with pride and without fear, and that his difference is not a barrier, but part of what makes him unique.