4.1 State of the art of useful materials and legislation for deaf at HEIs

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Table of contents

1 Introduction

This document presents a comparative overview of existing policies, resources, and practices related to the educational inclusion and linguistic rights of deaf people across different European contexts. Educational inclusion and the protection of linguistic rights have become key priorities throughout Europe, reflecting a growing commitment to diversity, equity, and social participation.

Despite considerable progress in legislation and educational practice, challenges persist in ensuring that deaf students have equal access to learning opportunities and can fully exercise their linguistic rights. Differences in national policies, institutional support, and available resources lead to unequal experiences for deaf individuals across countries.

By compiling and analyzing legal frameworks, educational materials, institutional contacts, and research outputs from multiple European nations, this document seeks to provide partners and stakeholders with a comprehensive perspective that facilitates knowledge exchange, highlights common challenges, and supports the development of shared strategies. Ultimately, the report aims to contribute to the creation of more inclusive and equitable educational environments for deaf people throughout Europe.

2 Legal framework

This chapter provides a comparative overview of national and regional legal frameworks, strategies, and measures aimed at promoting the linguistic rights and educational inclusion of deaf people across several European countries. It focuses on key legislative foundations, policy developments, and institutional practices that govern the recognition and use of sign languages as well as access to inclusive education.

Drawing on examples from Spain, Poland, Austria, and Germany, the chapter highlights different national approaches. Spain, through laws such as Law 27/2007 and its subsequent developments, has strengthened the legal status of Spanish Sign Language. Poland emphasizes the protection of communication rights and access to interpretation services, while Austria demonstrates a strong cultural and constitutional recognition of Austrian Sign Language, including its designation as intangible cultural heritage. Germany, in turn, applies a systemic framework encompassing disability equality, accessibility regulations, and inclusive higher education measures.

By presenting these comparative insights, the chapter illustrates that robust legal and institutional safeguards for sign languages are essential to ensuring equal opportunities and full social participation for deaf individuals. Furthermore, it seeks to identify successful national practices that can foster European cooperation and the development of more inclusive educational and linguistic policies.

2.1 Spain

The recognition and protection of linguistic rights are fundamental to ensuring equality, accessibility, and full social participation for deaf, deafblind, and hard-of-hearing individuals. In Spain, significant progress has been made over the past two decades to strengthen these rights through comprehensive national and regional legislation, institutional initiatives, and academic research.

In the following the principal legal instruments and analytical studies that form the basis of the Spanish framework for the use and promotion of Spanish Sign Language (LSE) and communication support measures will be presented.

- **NATIONAL LEGAL FRAMEWORK**

Law 27/2007, of October 23
This Royal Decree establishes the conditions for the use of Spanish Sign Language and communication support measures for deaf, hard-of-hearing, and deafblind individuals. It

regulates aspects such as the learning, knowledge, and use of Spanish Sign Language, guaranteeing the free choice of language and promoting accessibility in various fields, including education, social services, and culture.

Link: Royal Decree 674/2023, of July 18

- **Royal Decree 674/2023, of July 18**

This decree provides regulatory development for Law 27/2007, detailing the conditions for the use of sign language and communication support measures. It strengthens the effective implementation of the rights recognized in the law.

- **Law 26/2011, of August 1**

Adapts Spanish legislation to the International Convention on the Rights of Persons with Disabilities, strengthening the linguistic and accessibility rights of deaf people.

2.2 Regional Legislation (Andalusia)

- **Law 11/2011, of December 5**

Regulates the use of Spanish Sign Language and communication support measures in Andalusia, promoting its teaching, protection, and use under equal conditions.

- **Law 1/1999, of March 31**

Establishes measures for the care of people with disabilities in Andalusia, including provisions to ensure communication accessibility and the training of sign language interpreters.

- **Order of October 16, 2013**

Establishes the Special Monitoring Commission for Law 11/2011, responsible for overseeing the implementation and compliance with measures related to sign language and communication support in Andalusia.

ANALYTICAL AND RESEARCH CONTRIBUTIONS

- **Approach to the Linguistic Rights of Deaf People**

  Study on linguistic rights, regulatory research, and analysis of educational inclusion.

This study addresses the linguistic rights of deaf people in Spain, focusing on their educational inclusion and regulations. It analyzes the situation of sign language in the country and reflects on how policies and regulations impact accessibility and the rights of deaf students, especially in terms of bilingual education. The report provides a detailed view of the progress and challenges in integrating sign language into the educational system.

Link: https://acortar.link/25qFFw

- **Legal Assessment Report on Law 27/2007**

Legal report on Law 27/2007, which recognizes Spanish Sign Languages and regulates communication support measures.

This report, written by Enrique Belda Pérez-Pedrero and Francisco José Sierra Fernández, provides a detailed legal analysis of Law 27/2007, 15 years after its enactment. It examines aspects such as the law's position in the Spanish legal system, relevant issues in its articles, and practical concerns arising from its implementation. The document emphasizes the importance of a favorable interpretation of the law to ensure the rights and freedoms of deaf, deafblind, and hard-of-hearing individuals, highlighting the need for effective application by legal and social operators.

Link: https://acortar.link/y39Lpe

2.3 Poland

Poland has established a comprehensive legal framework to protect the rights of deaf, hard-of-hearing, and deafblind individuals, with a particular focus on education, accessibility, and the use of Polish Sign Language (PJM). The country's legislation ensures equal opportunities in education and public life while providing specific measures to support communication needs.

This section presents the most relevant legal acts in Poland, highlighting how they recognize the rights of deaf people, regulate access to services and interpreters, and promote inclusive education. Together, these laws form the foundation for linguistic rights and accessibility in the Polish context.

- **Constitution of the Republic of Poland**

The Constitution is the highest legal act in Poland and guarantees equal rights to education for all citizens, including people with disabilities. It establishes the general principle of equality and non-discrimination, which underpins all further legislation related to accessibility and inclusion.

Link: https://acortar.link/N3Mxhk

- **Act of 19 August 2011 on Sign Language and Other Means of Communication**

The document defines eligible persons (including the deaf), describes their right to services, benefits and subsidies, including providing a sign language interpreter for a deaf person, subsidising Polish Sign Language (PJM) training, and maintaining a register of PJM interpreters.

Link: https://acortar.link/YLssp9

- **Act of 14 December 2016 – Education Law**

The Education Law organizes special education, including for deaf students. It allows schools to employ PJM interpreters and provides for both integrated and special classes with tailored support to meet students' needs. This ensures that deaf students can fully participate in education on an equal basis with their peers.

Link: https://acortar.link/Eg5UVN

2.4 Austria

Austria has taken significant steps to recognize and protect the linguistic and educational rights of deaf individuals. The country emphasizes the importance of Austrian Sign Language (ÖGS) both as an independent language and as a cultural heritage, while ensuring that deaf children have access to inclusive education and communication support.

This section presents key national and international instruments, declarations, and policies that support the rights of deaf people in Austria. The overview highlights constitutional recognition, UNESCO heritage status, educational policies, and international conventions, illustrating Austria's commitment to accessibility, linguistic inclusion, and the protection of the rights of deaf individuals.

- **Recognition of Austrian Sign Language (ÖGS)**

Austrian Sign Language is officially recognized as an independent language in the Austrian Constitution. This constitutional recognition affirms its status and supports its use in education, public services, and cultural life.

Link: https://acortar.link/HuXKyP

- **Austrian Sign Language as Intangible Cultural Heritage**

ÖGS is recognized by UNESCO as part of Austria's intangible cultural heritage. This status emphasizes the cultural and social importance of sign language and strengthens efforts to preserve and promote it nationally.

Link: https://acortar.link/mUfR0I

- **Declaration of Rights of Deaf Children**

Austria endorses specific rights for deaf children, ensuring access to education, communication, and social participation. These rights are framed to guarantee equality and protect the interests of deaf minors in all areas of life.

Links: German Version and English Version

- **Education Rights for Deaf Children**

The World Federation of the Deaf (WFD) provides policy guidance on the educational rights of deaf children, supporting inclusive and accessible learning environments. Austrian policies align with these principles, ensuring the use of ÖGS in schools and special support for students.

Link: https://acortar.link/0CdOoZ

- **International Conventions and Rights Instruments**

Austria is committed to international standards on disability rights, including the **UN Convention on the Rights of Persons with Disabilities (UNCRPD)**. These frameworks guide national policies and ensure that deaf individuals receive equitable treatment in education, employment, and public services.

Links: German UNCRPD and English UNCRPD

- **Support Services and Special Provisions for Students with Disabilities**

The Austrian Federal Ministry of Women, Science and Research provides guidance and support for students with disabilities, including those who are deaf, to ensure accessibility in higher education and professional development. Additional resources are available through platforms such as STUDIEREN.AT.

Links: https://acortar.link/PhwTtE and https://acortar.link/PhwTtE

2.5 Germany

Germany has established a comprehensive legal and policy framework to ensure accessibility, equal participation, and educational inclusion for people with disabilities, including deaf and hard-of-hearing individuals. German legislation combines binding international commitments, national laws, ordinances, and higher-education regulations to guarantee the rights of students and citizens while promoting accessibility in public services and digital environments.

This section provides an overview of the most relevant legal instruments and practical measures that support linguistic rights, accessibility, and inclusive education in Germany.

- **UN Convention on the Rights of Persons with Disabilities (CRPD)**

Germany ratified the CRPD on 24 February 2009. The Convention is legally binding and frames Germany's national obligations to ensure equal participation and accessibility for people with disabilities, including educational and communication rights for deaf individuals.

Link: https://acortar.link/cBH8C3

- **Act on Equal Opportunities of Persons with Disabilities (Behindertengleichstellungsgesetz — BGG)**

The BGG establishes obligations for federal agencies to provide accessibility and equal opportunities. The Federal Government Commissioner for Matters relating to Persons with Disabilities monitors compliance and enforces parts of the law.

Link: https://acortar.link/9imUhU

- **Barrier-Free Information Technology Ordinance (BITV 2.0)**

BITV 2.0 regulates the accessibility of public-sector websites and IT systems, aligned with EN 301 549 and WCAG standards. Universities, as public institutions, are required to provide

accessible online content, including multi-sensory presentation formats such as German Sign Language (DGS) or easy-to-read summaries for key information.

Link: https://acortar.link/7CuXEB

- **Accessibility Strengthening Act (BFSG)**

This recent national law strengthens enforcement of accessibility requirements for public bodies and certain private services. It includes timelines and penalties for non-compliance, ensuring that accessibility obligations are legally binding.

Link: https://acortar.link/jt3KzC

- **Social Code Book IX (SGB IX)**

SGB IX provides a statutory framework for rehabilitation, vocational, and educational inclusion measures. It may also offer financial support routes for students and workers with disabilities, supporting participation in education and employment.

Link: https://acortar.link/N6aIKF

- **Higher Education Practices: Nachteilsausgleich (compensation for disadvantages) and Higher-Education regulations**

German universities implement exam accommodations (Nachteilsausgleich) to ensure equal participation for students with disabilities. Measures include additional exam time, alternative formats, and use of assistive technology. Students must submit medical or diagnostic documentation and apply through university disability offices. Implementation varies across federal states (Länder), but central disability services coordinate and ensure compliance with legal obligations.

Link: https://acortar.link/ua89Id

- **Public institutions are legally required to make digital content accessible under BITV 2.0 and the Accessibility Strengthening Act (BFSG).**

Combined with anti-discrimination obligations and the provision of *Nachteilsausgleich* (exam accommodations), these measures make reasonable adjustments mandatory rather than optional, ensuring equal opportunities for all students. Implementation may vary across federal states (*Länder*) and individual universities, with central disability offices (*Zentrale*

Studienberatung / Beratungsstellen) coordinating and overseeing the specific arrangements. legal obligations.

Link: https://acortar.link/ua89Id

2.6 Italy

This information is missing

2.6 Conclusions

This chapter shows how Spain, Poland, Austria, and Germany have established solid legal and institutional structures to uphold the linguistic rights and educational access of deaf people. Spain's recognition of its national and regional sign languages, Poland's organized interpretation services, Austria's constitutional recognition of Austrian Sign Language, and Germany's comprehensive accessibility and anti-discrimination policies together reflect a strong legal commitment to inclusion. Beyond legislation, these examples reveal that real equality depends on consistent implementation, service accessibility, and sustained institutional support—offering valuable lessons for European collaboration and policy improvement.

3. Educational resources

This chapter presents an overview of educational resources, training initiatives, and technological supports that promote the linguistic and educational inclusion of deaf people across several European countries. It focuses on practical tools, teaching materials, and institutional initiatives that facilitate the use of national sign languages and enhance accessibility in both school and university contexts.

In Spain, a broad ecosystem of bilingual education resources and sign language materials—such as the *Bilingual Education Guide for Deaf Children*, the *DILSE Dictionary*, and the *LSE in the Classroom* platform—reflects a strong commitment to integrating Spanish Sign Language (LSE) into education. Similar developments can be observed in Poland, where national initiatives such as *Migaj razem z nami* support teachers and learners of Polish Sign Language (PJM). In Italy, universities have taken significant steps to provide sign language interpreting services, develop innovative LIS training programs, and promote research in signed language linguistics. Austria contributes through awareness materials and professional training resources, while Germany demonstrates an advanced combination of human-mediated services, digital tools, and research-driven technologies that support accessibility in higher education.

Together, these initiatives illustrate the diversity of approaches to deaf education and sign language promotion across Europe. By mapping these resources and best practices, the chapter aims to support cross-country collaboration, highlight innovative models, and encourage the development of inclusive educational environments that respect the linguistic rights of deaf individuals.

3.1 Spain

This compilation presents specialized resources and documents that promote the bilingual education of deaf individuals and the use of Spanish Sign Language (LSE) within the educational field. It includes pedagogical guides, training materials, visual dictionaries, and academic proposals developed by leading institutions. Together, these resources provide guidance and tools for educators and professionals, fostering inclusive, accessible education aligned with the linguistic and cultural diversity of the deaf community.

- **Bilingual Education Guide for Deaf Children**

Educational guide.

This guide provides guidelines for the bilingual education of deaf children, promoting the use of both sign language and spoken language in the educational process.

Link: https://www.cnse.es/media/k2/attachments/guia_educacion_bilingue.pdf

- **DILSE - Spanish Sign Language Dictionary**

DILSE is a bilingual (LSE-Spanish) dictionary containing over 10,000 signs accompanied by photographs and videos produced by deaf professionals. It is a valuable educational tool for learning Spanish Sign Language (LSE), designed for use by both students and educators, facilitating the understanding and teaching of this language.

Link: https://fundacioncnse-dilse.org/

- **LSE in the Classroom - Educational Portal**

Online educational resource, training platform, tools for integrating sign language into education.

The "LSE in the Classroom" portal provides educational resources for integrating Spanish Sign Language (LSE) into the educational environment. It offers tools for teachers and students, promoting the use of LSE in classrooms and improving accessibility for deaf students. This resource includes training materials, courses, and guides that support inclusive practices in education, allowing educators to develop skills for teaching and promoting the use of sign language in the classroom.

Link: https://www.cnse.es/lseaula/#gsc.tab=0

- **White Paper on Spanish Sign Language**

Educational guidelines, pedagogical recommendations, training guides, teaching resources, and proposals for integrating sign language into the educational environment.

The White Paper on Spanish Sign Language provides a comprehensive overview of the status of sign language in Spain, with a special focus on its inclusion in the educational field. It includes recommendations for integrating LSE into classrooms and strategies for improving accessibility for deaf students. It also offers a guide for educators on how to effectively use sign language in the classroom.

Link: https://www.oeglb.at/wp-content/uploads/2022/03/rechte_und_konventionen.pdf

- **LSE Image and Sign Bank**

Online educational resource with images and videos of Spanish Sign Language (LSE) signs. The LSE Image and Sign Bank is an initiative by the Fundación CNSE to provide the educational community with images and photographs of Spanish sign language signs. This resource is especially useful for teachers, speech therapists, and families working with deaf students in early childhood and primary education.

Link: https://live.european-language-grid.eu/catalogue/tool-service/15356

- **Virtual Sign Language Library of the CNLSE**

Digital bibliographic resource specializing in Spanish sign language.

The Virtual Sign Language Library of the CNLSE offers access to an extensive collection of bibliographic and documentary materials on Spanish sign language and its linguistic community. It includes books, documents, videos, and major specialized journals, providing direct access to materials and promoting research in this field. It is an essential resource for professionals, academics, and students interested in deepening their understanding of Spanish sign language.

Link: https://cnlse.es/es/recursos/biblioteca

- **Basic Training Proposal for Spanish Sign Language Interpreters and Guide-Interpreters for Deafblind People**

University training proposal.

This document, prepared by the Centro de Normalización Lingüística de la Lengua de Signos Española (CNLSE) in 2015, establishes a common framework for the university training of Spanish sign language interpreters and guide-interpreters for deafblind people. It includes professional competencies, curriculum plans, and general characteristics of training programs, aiming to integrate this training within the Spanish educational system and address the needs of users and professionals in the sector.

Link: https://broschuerenservice.sozialministerium.gv.at/Home/Download

3.2 Poland

In the context of education for the deaf, in Poland, the most popular materials are those related to education in the field of Polish Sign Language, which helps teachers communicate with deaf students.

- **Migaj razem z nami**

Free multimedia Polish Sign Language course at levels A1, A2, B1, B2.
Link (info): https://www.gov.pl/web/nauka/migaj-razem-z-nami-multimedialny-kurs-polskiego-jezyka-migowego-pjm

Link (download): https://zpe.gov.pl/a/migaj-razem-z-nami---kurs-polskiego-jezyka-migowego-pjm/DipfoQ5uN

- **Migaj z nami: PJM**

The mobile application teaches the basics of PJM, develops communication skills. Contains over 500 films including 43 thematic lessons, alphabet, numerals, a glossary of signs, frequent expressions needed in everyday communication, quizzes tailored to individual lessons.

Link: https://play.google.com/store/apps/details?id=mobi.qrtag.migajznami

3.3 Italy

In Italy, several universities have taken significant steps to promote accessibility and inclusion for deaf and hard-of-hearing students. Institutions such as the Universities of Palermo, Bari, Salento, Foggia, Parma, Pisa, and Roma Tre have implemented a variety of initiatives—from professional LIS interpreting and communication assistance to innovative video interpreting systems and specialized academic programs in sign language studies. These actions reflect a growing national commitment to ensuring equal educational opportunities and fostering inclusive learning environments within higher education.

- **University of Palermo**

It offers two professional roles to support the inclusion of deaf students: the LIS interpreter, who translates into Italian Sign Language during lectures and events, and the communication assistant, who supports the student using LIS as well as integrated communication methods, also facilitating peer interaction and participation in laboratory activities.

Link: https://www.unipa.it/Assistenza-alla-comunicazione-per-studenti-sordi-/

- **Universities of Bari, Salento, Foggia, and the Polytechnic University of Bari**

These universities in the Apulia region have implemented an innovative video interpreting service in Italian Sign Language (LIS), available at public-facing offices and service desks. Users can initiate a video call with a professional LIS interpreter via a QR code or a dedicated link, facilitating communication with university staff.
Link**:** https://www.uniba.it/it/ateneo/rettorato/ufficio-stampa/comunicati-stampa/anno-2025/universita-piu-inclusive-al-via-innovativo-servizio-lis

- **University of Parma**

The LILS Project is a pilot initiative aimed at developing a university degree program in Linguistic Mediation Studies for translators and interpreters of international sign languages. The project has five key objectives:

1. Introduce a university-level course tailored to sign language translation and interpretation
2. Create a genuinely inclusive educational environment that welcomes both hearing and deaf students without discrimination or barriers
3. Deepen research into the epistemology and sociolinguistics of signed languages
4. Develop and standardize a frequency-based lexicon of Italian Sign Language (LIS) and an academic-purpose dictionary
5. Redefine the professional identity and graduate competencies of signed language interpreters

Link: https://www.unipr.it/notizie/luniversita-di-parma-capofila-di-un-progetto-sulla-lingua-dei-segni-italiana

- **University of Pisa**

During the COVID-19 period, it provided LIS interpreting services for online lectures as well as real-time captioning to ensure accessibility for deaf students.

Link: https://www.unipi.it/index.php/news/item/18204-lezioni-a-distanza-con-l-interprete-lis-per-gli-studenti-sordi

- **Roma Tre University**

The university provides LIS interpreting services to support deaf students during academic activities, exams, and meetings with faculty members and administrative staff.

Link: https://portalestudente.uniroma3.it/iscrizioni/disabilita/servizi-disabilita/interpretariato-della-lingua-dei-segni-italiana-lis/

3.4 Austria

This selection presents educational and informational resources aimed at enhancing teaching practices and communication with deaf and hard of hearing students in higher education. The materials include practical guides on communication and visual design in teaching and counselling, online training modules for professionals working with deaf children and young people, and printed resources to promote Deaf awareness. Together, they provide valuable support for educators and institutions seeking to foster inclusive and accessible learning environments.

- **Information materials for colleges and universities**

improving teaching and communication. The topics cover communication, information for d/Deaf students as well as tips on the (visual) design of teaching and counselling.

Link: https://opus4.kobv.de/opus4-haw-landshut/frontdoor/index/index/docId/132

- **National Deaf Children's Society**

The free online learning modules (15-60 min.) are designed to help professionals and practitioners working with children and young people with any level of deafness and hearing loss.

Link: https://www.ndcs.org.uk/advice-and-support/ways-we-can-support-you/training-and-online-learning/free-online-learning

- **Various kinds of printed information material to raise Deaf awareness**

Link: https://ndcs-bookshop.myshopify.com/collections/deaf-awareness-resources

3.5 Germany

This overview summarizes a wide range of materials, technologies, and services designed to support accessibility for deaf and hard of hearing students in higher education. It categorizes both commercial solutions and research prototypes, covering human-mediated services such as sign language interpreting, real-time captioning, and academic support, alongside digital and assistive technologies including automatic speech recognition tools, accessible learning platforms, and hearing-assist hardware. Additionally, it highlights emerging innovations in augmented reality, smart glasses, and sign-language avatar systems, as well as ongoing research on AR-based captioning and sign-language recognition. Together, these resources illustrate the current landscape of accessibility tools and developments that enhance inclusion and participation in academic environments.

- Overview of available materials & services

Human-mediated services (baseline)

Sign-language interpreters (DGS): on-site or remote (video relay). Universities typically coordinate requests through *Vermittlungszentralen* (regional interpreter dispatch centers) or via studierendenWERK disability advice offices. Procurement/booking frameworks exist per federal state.

Link: (stW Berlin)

CART / real-time stenography (human captioners): certified CART providers produce verbatim captions in live sessions (used in many Anglophone universities; present in Germany as specialist suppliers). CART is ideal for high-accuracy lecture captioning where ASR is unreliable.

Link: captioningstar.com

Notetakers / academic support assistants: human note-taking, lecture summaries, mentoring and tutoring. Many student services (Studierendenwerke) provide such supports.

Link: (Studierendenwerke)

- **Traditional digital supports (commercial)**

Automatic Speech Recognition (ASR) — live captions: Google Live Transcribe, Microsoft Azure Speech Services / Microsoft Translator (presentation/live captions), Amazon Transcribe, other ASR-based live-caption apps. Widely used for immediate but imperfect captions; useful

as a cost-effective fallback. (Quality varies with acoustics, domain vocabulary, speaker accents.)

Link: Ava

Lecture capture with time-coded captions: University lecture-recording platforms + post-processing captioning (human or ASR) so recordings are searchable and accessible asynchronously.

Link: SAGE Journals

Accessible LMS + accessible slides / documents: Use WCAG-compliant documents, clear slide design, transcripts. German digital accessibility regulation (BITV/BFSG) motivates institutions to make online content accessible.

Link: Level Access

FM / induction loop and hearing-assist hardware: For hard-of-hearing students who use hearing aids/CI, room induction loops / FM systems improve signal-to-noise ratio.

- **Augmented Reality (AR) & head-worn devices — commercial**

Xander® Glasses (Xander Glasses): glasses that capture speech with microphones and display captions on lenses (semi-transparent, personal display). Marketed for daily conversation and meetings; potentially useful in seminars/office hours.

Link: Xander Glasses

Other smart glasses / HMDs capable of showing captions (Vuzix, small AR startups): some companies offer caption overlays or text-on-lens SDKs to show captions near speakers' faces. (Evaluate latency, comfort, and battery life.)

Mobile apps adapted for near-eye display: smartphone apps can be mirrored to AR displays or used on tablet in front-row for captions.

- **Comments on commercial AR devices:** Commercial AR captioning products are improving, but must be evaluated for

1. latency (delay),
2. transcription accuracy for technical vocabulary,
3. privacy (mic capture in classrooms)
4. wearability in lecture settings. (Computer Science U of T)

- **Augmented Reality & immersive systems — research prototypes**

Real-time AR caption systems (HMD prototypes / edge computing): academic projects prototype AR captions delivered to head-mounted displays with edge servers to reduce latency and position captions for minimal eye movement. Studies stress latency thresholds and ergonomics for classroom use. Example research: SeEar / tailored AR captioning interfaces and latency studies.

Link: ACM Digital Library

AR + multimodal systems integrating speaker visualization: Projects explore coupling captions with speaker identification and visual cues (who's speaking) to help follow multi-speaker interactions.

Link: NSF Public Access

Sign-language avatar systems (text-to-sign / 3D avatars): research projects (AVASAG, SignAvatars and other EU/DE projects) develop live or near-live translation from text to DGS using 3D avatars. These systems produce synthetic signers for short, structured texts (municipal info, web pages), and are the basis for "sign-language avatars" used by some German municipalities and public services. Research shows promise but also known limitations in naturalness and comprehensibility — consultation with deaf communities is essential.

Link: ACL Anthology

Sign-language recognition / production research datasets: large datasets (e.g., SignAvatars) and benchmarks are enabling better models for both recognition and avatar-driven production — an active research area with rapid progress.

Link: arXiv

3.6 Conclusion

This section presents the variety and richness of educational initiatives and digital tools promoting inclusion for deaf and hard-of-hearing learners across Europe. From bilingual teaching guides and sign language dictionaries in Spain, to innovative online courses in Poland, LIS interpretation services in Italy, awareness programs in Austria, and advanced hybrid technologies in Germany, each country contributes distinctive approaches to

accessibility. Together, these examples emphasize the power of combining pedagogy, professional development, and assistive innovation to build inclusive learning environments that respect linguistic diversity and ensure equal participation.

4. Scientific Papers

This section compiles a selection of scientific studies, technical reports, and academic contributions that explore educational inclusion, linguistic rights, and technological advancements related to the deaf community across Europe. The collected works—ranging from national reports to international research—offer valuable insights into bilingual education models, sign language recognition systems, and accessibility practices in higher education. Together, they provide an evidence-based foundation that supports innovation, policy development, and collaborative progress toward more inclusive learning environments for deaf and hard-of-hearing individuals.

4.1 Spain

This collection of technical reports provides a comprehensive overview of key aspects related to the bilingual education and professional development surrounding Spanish Sign Language (LSE). The documents address the implementation of bilingual educational models in LSE and spoken language, the definition and training of professional profiles associated with LSE, and the current state of university programs for interpreters and guide-interpreters for deafblind individuals.

- **Report on Bilingual Education in Sign Language and Spoken Language for Deaf Students**

Technical report on bilingual education in Spanish Sign Language (LSE) and spoken language.

This report, prepared by Lourdes Gómez Monterde and María Bao-Fente, aims to describe the bilingual educational model in LSE and spoken language, as well as identify the existing resources and needs to facilitate the implementation of the bilingual educational model established by Law 27/2007 and Royal Decree 674/2023. The document includes a literature review, a survey on the use of LSE in schools, and an analysis of experiences developed so far, providing guidance and proposals for the development of inclusive bilingual educational models in various contexts and educational modalities.

Link: https://acortar.link/n9Byco

- **Technical Report on Professional Profiles Linked to Spanish Sign Language (LSE)**

Technical report on professional profiles related to LSE.

This report is part of the Strategic Framework for the Protection, Promotion, and Revitalization of Spanish Sign Language 2023-2030 and aims to identify and describe the professional

profiles linked to LSE. It provides a detailed overview of the skills, roles, and training needs of these professionals, contributing to the improvement of service quality in the sign language sector and the consolidation of LSE in various social contexts. This document is a key resource for educational institutions, public administrations, and organizations working on the inclusion and accessibility of deaf people.

Link: https://acortar.link/iFg4sc

- **Report on University Training for Spanish Sign Language Interpreters and Guide-Interpreters for Deafblind People**

Technical report on university training in sign language interpretation and guide-interpretation.

This report, prepared by the Centro de Normalización Lingüística de la Lengua de Signos Española (CNLSE), analyzes the current state of university training for Spanish sign language interpreters (LSE) and guide-interpreters for deafblind people in Spain. It highlights the limited availability of official university programs dedicated to this training, which restricts professional development and the quality of interpreting services. The document emphasizes the need for greater integration of LSE in higher education to ensure the linguistic rights of deaf and deafblind individuals. This resource is essential for universities, educational policy makers, and organizations seeking to improve accessibility and inclusion in the academic field.

Link: https://acortar.link/88mY0J

4.2 Italy

This selection of academic publications presents recent advances and multidisciplinary approaches in the field of automatic sign language recognition, combining artificial intelligence, deep learning, and wearable technologies. The studies explore the application of machine learning models such as LSTM and ResNet networks, sensor-based systems like Leap Motion and Myo armbands, and camera-based recognition frameworks to improve the accuracy and real-time performance of sign language translation. Collectively, these works highlight ongoing progress and remaining challenges in developing intelligent systems capable of recognizing and interpreting sign languages across different linguistic and technological contexts, contributing valuable insights to research and educational innovation.

- **Machine learning methods for sign language recognition: A critical review and analysis**, 2021, I.A.Adeyanju, O.O.Bello, M.A.Adegboye. Published by: ScienceDirect.

The literature review presented in this paper shows the importance of incorporating intelligent solutions into the sign language recognition systems and reveals that perfect intelligent systems for sign language recognition are still an open problem.
Link: https://www.sciencedirect.com/science/article/pii/S2667305321000454

- **Sign language recognition and translation: A multidisciplined approach from the field of artificial intelligence**, 2005,Becky Sue Parton. Published by: Oxford academic.

This article examines significant projects in the field, starting with finger-spelling hands such as "Ralph" (robotics), CyberGloves (virtual reality sensors used to capture isolated and continuous signs), camera-based projects such as the interactive American Sign Language game "CopyCat" (computer vision), and sign recognition software (Hidden Markov Models and neural network systems).

It also discusses avatars like "Tessa" (Text and Sign Support Assistant; 3D imaging) and spoken-to-sign language translation systems, such as the Polish project "THETOS" (Text into Sign Language Automatic Translator, operating in Polish; natural language processing).
The application of this research in education is also explored. For instance, the "ICICLE" project (Interactive Computer Identification and Correction of Language Errors) uses intelligent computer-assisted instruction to develop a tutorial system for deaf or hard-of-hearing children, analyzing their English writing and providing personalized lessons and recommendations.

Link: https://academic.oup.com/jdsde/article-abstract/11/1/94/410770

- **A Modified LSTM Model for Continuous Sign Language Recognition Using Leap Motion**, 2019, Anshul Mittal, Predeep Kumar, et al. Published by:IEEE Xplore.

In this article, a modified Long Short-Term Memory (LSTM) model is proposed for continuous gesture recognition, specifically for sequences of Indian Sign Language (ISL) signs and sentences captured using the Leap Motion system. The approach is based on splitting continuous signs into sub-units, which are then modeled using neural networks. This eliminates the need to consider different combinations of sub-units during training. The system achieved an average accuracy of 72.3% for signed sentences and 89.5% for isolated signs.

Link: https://ieeexplore.ieee.org/document/8684245

- **Novel Wearable System to Recognize Sign Language in Real Time**, 2024, jlhan Umut, Ümit Can Kumdereli, Published by: NIH(National center for Biotechnology Information).

In this study, 80 frequent gestures of Turkish Sign Language were captured using two Myo armbands by Thalmic Labs, equipped with inertial (IMU) and electromyographic (EMG) sensors. In this case, the highest accuracy was achieved using the deep learning Weka algorithm, reaching 99.875%, while the lowest-performing algorithm, Naive Bayes (NB), obtained an accuracy of 87.625%.

Link: https://www.mdpi.com/1424-8220/24/14/4613

- **Video-Based Sign Language Recognition via ResNet and LSTM Network,** 2024, Jiayu Huang, Varin Chouvatut, Published by: MPDI.

Four state-of-the-art CNN models—AlexNet, VGG16, GoogleNet, and ResNet—were evaluated for the recognition of 32 signs from the Arabic Sign Language alphabet. The results showed that AlexNet achieved the highest accuracy at 94.81%, while the VGG16 model recorded the lowest accuracy at 82.30%.

Link: https://www.mdpi.com/2313-433X/10/6/149

- **A Real Time Arabic Sign Language Alphabets (ArSLA) Recognition Model Using Deep Learning Architecture"**, 2022, Zaran Alsaadi, Easa Alshamani, et al. Published by: MDPI.

LSTM networks have been successfully employed for modelling temporal sequences, a key aspect in the recognition of dynamic gestures, in this study were combined LSTM and Residual Networks (ResNet) for the recognition of 64 categories of everyday words in Argentine Sign Language. This combination achieved an accuracy of 86.25% and a precision of 87.77%.

Link: https://www.mdpi.com/2073-431X/11/5/78

4.3 Austria

This collection of academic and professional publications explores the experiences, challenges, and support structures for deaf and hard-of-hearing students in higher education. The works include empirical studies, theses, and articles addressing accessibility in libraries and universities, the role of assistive technologies, and institutional readiness to provide inclusive learning environments. They also examine social and communication barriers,

misconceptions about deaf learning styles, and the underrepresentation of deaf academics. Collectively, these sources offer valuable insights and recommendations for improving access, participation, and equity in academic settings, emphasizing the importance of deaf-centered approaches and systemic inclusion.

- Article published in “Mitteilungen der Vereinigung Österreichischer Bibliothekarinnen und Bibliothekare”.
  Giribets-Morón, Mireia/Jandl, Jacopo (2023): ***Teilnahme ist nicht verhandelbar: Bibliotheken für gehörlose und schwerhörige Menschen*** (Participation is Non-Negotiable: Libraries for Deaf and Hard of Hearing People).
  Language: German

This paper summarises the conclusions reached by the project "Open Science for Everybody! Accessibility to Information for Deaf and Hard of Hearing Persons at Libraries" for the postgraduate course "Library and Information Studies" at the University of Vienna. It describes the problems deaf and hard-of-hearing people face in libraries and presents measures taken by different libraries (among them university libraries like Gallaudet University Library) to improve accessibility.

DOI: https://doi.org/10.31263/voebm.v76i1.7870

- Diploma thesis of students of the University of Vienna
  Stiglitz, Sandra Pia Theres/Zeleznik, Christine Karol (2009): ***Stellt sich die Uni taub? Integration gehörloser Studierender an der Universität Wien*** (Is the University pretending not to hear? Integration of Deaf Students at the University of Vienna).
  Language: German

This Diploma thesis discusses the situation and problems of deaf students at university. The focus is on the students’ social contacts whether they are successful and the impact of student support services. The thesis is divided into a theoretical part (background of Deaf Education and Integration) and an interview part (deaf students, lecturers, sign language interpreters, support services). It gives a good overview over the barriers deaf students face, especially when beginning their studies, and also highlights the communication problems, the missing information and the lack of Deaf Awareness that they are confronted with.

Link: https://utheses.univie.ac.at/detail/3084

- Study published in BAILEO: Journal Sosial Humaniora
  Alhulays, Sarah Abed (2024): ***The Role of Assistive Technology in Supporting Communication and Academic Access for Deaf Students: A Qualitative Study at***

***Gallaudet University*.**
Language: English

This study discusses the positive effect of assistive technology for deaf students (e.g., cloud services, mobile apps). Such technology can, for example, facilitate the communication and allow independent access to learning materials. The study is based on expert interviews with teachers from Gallaudet University.

Link:
https://www.semanticscholar.org/reader/1f7a3826fb50a939845c4e646b83e35fc6abab41

- Master's thesis of a student of the University of Vienna
  Aigner, Bettina (2020): ***"A fair chance in the race of life?" Eine qualitative Erhebung zu den Studienbedingungen gehörloser und hochgradig schwerhöriger Menschen in Österreich*** ("A fair chance in the race of life?" A qualitative survey on the study conditions of deaf and profoundly hard-of-hearing people in Austria).
  Language: German

This Master's thesis discusses the educational situation of deaf people, also with regard to tertiary education and connected assistive services. A part of the thesis is dedicated to interviews with Austrian institutions of tertiary education, concerning e.g., the number of deaf students at their institution, assistive services and experiences with deaf students.

Link:
https://www.semanticscholar.org/reader/1f7a3826fb50a939845c4e646b83e35fc6abab41

- Paper published in CBE – Life Sciences Education, Vol. 17, No. 3
  Braun, Derek C. et al. (2018): ***Welcoming Deaf Students into STEM: Recommendations for University Science Education*.**
  Language: English

This paper discusses the challenges d/Deaf students will probably face during their studies by following a hypothetical deaf student who is navigating her STEM major, from contacting the disability services office to classroom and research experiences.

Link: https://www.lifescied.org/doi/10.1187/cbe.17-05-0081

- Paper/Manuscript published in J Dev Phys Disabil and PMC PubMed Central
  Marschark, Marc et al. (2016/2018): ***Don't Assume Deaf Students are Visual Learners***
  Language: English

This study discusses different learning styles and challenges the general belief that deaf students are automatically visual learners.

Links: https://doi.org/10.1007/s10882-016-9494-0
https://pmc.ncbi.nlm.nih.gov/articles/PMC5362161/

- Article published online in The Mind Hears
  Michele Cooke (2019): ***Under-represented: Where are all the deaf and hard-of-hearing academics?***.
  Language: English

This short online article discusses the under-representation of deaf and hard-of-hearing scientists in academia and cites statistics from the USA.

Link: https://acortar.link/CC9xlw

- Chapter published in Sage Journals: Review of Research in Education, Vol. 45, Issue 1 (available online)
  Cawthon, Stephanie W./Garberoglio, Carrie Lou (2021): ***Evidence-Based Practices in Deaf Education: A Call to Center Research and Evaluation on the Experiences of Deaf People.***
  Language: English

Starting from the authors' personal experiences, this chapter views research on deaf education as well as educational interventions for deaf students through a "deaf-centered lens". It discusses implications and gives recommendations.

Link: https://doi.org/10.3102/0091732X20985070

- Article published in epaa/aape education policy analysis archives, Vol. 22, No. 13
  Cawthon, Stephanie W./Schoffstall, Sarah J./Garberoglio, Carrie Lou (2014): ***How Ready are Postsecondary Institutions for Students who are d/Deaf or Hard-of-Hearing?***
  Language: English

This online article discusses what postsecondary institutions can do to further the graduation of deaf and hard-of-hearing students, given that enrolment rates are comparable to those of hearing students, but a completion rate of postsecondary training of only approx. 25-30% is reached. It focuses both on individual and institutional readiness, arguing that the latter is not only an issue for specialised institutions. Indicators of institutional readiness include accommodations for deaf and hard-of-hearing students, their implementation and impact.

Link: https://epaa.asu.edu/index.php/epaa/article/view/1277/1606

- Blog entry published in the blog De Gruyter Conversations
  Thoma, Sebastian (2021): ***Studium und Promotion mit Hörbehinderung: Wir müssen reden!*** (Study and PhD with hearing loss: We need to talk!).
  Language: German

This post, written from personal experience, discusses the barriers deaf and hard-of-hearing face during their studies and on the way to their PhD.

Link: https://blog.degruyter.com/studium-und-promotion-mit-horbehinderung-wir-mussen-reden/

4.4 Germany

This section outlines recommended research directions and pilot initiatives in Germany focusing on the use of augmented reality (AR) to enhance accessibility for deaf and hard-of-hearing (DHH) students. Priorities include small-scale pilot studies testing AR caption glasses in academic settings, collaborative design with native German Sign Language (DGS) users for sign-avatar evaluations, and hybrid accessibility workflows combining automated speech recognition (ASR) with human correction. Further studies should examine ASR performance in specialized disciplinary contexts and assess the economic implications of human versus technology-based accessibility solutions. These initiatives aim to balance innovation, usability, and cost-effectiveness while addressing current limitations such as latency, accuracy, and avatar naturalness.

- **Suggested research and pilot projects focusing on augmented reality (AR)**

1. **Small-scale pilots** with a cohort of consenting DHH students using AR caption glasses during seminars and small lectures (measure latency, comprehension, fatigue). Compare AR-only vs human-CART + AR fallback.
2. **Co-design with DGS users** for any sign-avatar evaluation; recruit DGS-native evaluators for naturalness/comprehension testing.
3. **Hybrid workflows**: ASR + human correction for recordings; human CART for high-stakes live events; AR glasses for informal interactions.
4. **Study multilingual / technical-vocabulary performance** of ASR models in disciplinary contexts (STEM, law, medicine).
5. **Accessibility economics study**: cost-per-student comparison (human vs tech) to inform budgeting.

(There is active literature demonstrating feasibility but also limits — notably latency, semantic errors, and avatar naturalness.)

Link: Computer Science U of T

4.5 Poland

Information from Poland is missing...

4.5 Conclusion

The reviewed research underscores Europe's dynamic academic landscape dedicated to improving education and communication for deaf and hard-of-hearing individuals. Spanish studies advance bilingual education and interpreter training; Italian projects lead in technological innovation through AI and wearable translation tools; Austrian research focuses on accessibility and inclusion in higher education; and German initiatives explore hybrid and augmented reality-based accessibility solutions. Collectively, this growing body of work demonstrates how research, policy, and technology converge to enhance learning access and inform future inclusive practices and pilot programs.

5. Useful Contacts

This chapter compiles a list of key organizations, institutions, and professionals across several European countries that play an active role in promoting the linguistic rights, education, and social inclusion of deaf people. The purpose of this section is to provide project partners and stakeholders with reliable contacts and reference points for collaboration, knowledge exchange, and consultation in areas related to sign language, accessibility, and inclusive education.

In Spain, the *State Confederation of Deaf People (CNSE)* and *Rey Juan Carlos University* serve as national references in advocacy, education, and professional training in Spanish Sign Language (LSE). In Poland, a robust network of experts and organizations—including the *Polish Association of the Deaf*, *PITAGORAS Development Association*, and *RES-GEST Education and Support Centre*—offers extensive resources for training, interpretation, research, and community support. Italy presents a diverse landscape of institutions and associations, such as *ENS APS*, *FIAS*, and *ANIOS*, alongside recognized professionals in Italian Sign Language (LIS) education and interpretation. In Austria and Germany, both higher education institutions and national associations like *GESTU*, *IntegriertStudieren*, and the *Deutscher Gehörlosen-Bund e.V.* provide specialized assistance for deaf and hard-of-hearing students, as well as structures for interpreter coordination and accessibility services.

By consolidating these contacts, the chapter aims to strengthen future cooperation and communication among stakeholders at the European level. These connections represent valuable entry points for developing joint initiatives, accessing expertise, and fostering inclusive practices that ensure the full participation of deaf individuals in education and society.

5.1 Spain

This section highlights key institutions in Spain that play a central role in promoting the rights, education, and inclusion of deaf individuals. The State Confederation of Deaf People (CNSE) serves as the national reference for advocacy and accessibility in Spanish Sign Language (LSE), while Rey Juan Carlos University (URJC) contributes to research, training, and higher education initiatives supporting linguistic and educational inclusion.

- **State Confederation of Deaf People (CNSE)**

Website: https://www.cnse.es/

- **Rey Juan Carlos University (URJC)**

Website: https://en.urjc.es/

5.2 Poland

This section presents key organizations and experts in Poland dedicated to the promotion of Polish Sign Language (PJM), the education of deaf individuals, and the advancement of accessibility and inclusion. The Polish Association of the Deaf, PITAGORAS Development Association, and RES-GEST Education and Support Centre form a strong national network providing educational, linguistic, and psychological support, as well as community-based initiatives. Alongside these institutions, leading specialists and educators contribute to research, interpreter training, and the professional development of deaf and hard-of-hearing individuals, reinforcing Poland's commitment to bilingual education and equal participation.

- **Polish Association of the Deaf**

The largest organization in Poland associating deaf and hard of hearing people. It operates in many fields: educational support, certification of PJM interpreters, European Funds projects, awareness campaigns. It also publishes the magazine "Świat Ciszy" intended specifically for the needs of deaf and hard of hearing people.
Links: https://www.pzg.org.pl/, https://cemn.pzg.org.pl/

Dr Michał Garncarek - Director of the Educational Centre Sign Naturally of the Polish Association of the Deaf and member of the Polish Sign Language Council at the Ministry of Family, Labour and Social Policy. Expert in teaching PJM as a foreign language.
mail: michal.garncarek@pzg.org.pl **phone:** +48 882 067 805

Katarzyna Madry – PJM course coordinator
mail: cemn@pzg.org.pl **phone:** +48 669 429 233, +48 882 916 234

Website: https://www.pzg.org.pl/polish-association-of-the-deaf/

- **PITAGORAS Development Association**

An association working for the deaf. It offers Polish Sign Language courses, translation services for institutions and individuals, online consultations, career counselling, and psychological support in sign language. It creates new educational tools for the deaf within European projects.
Piotr Krupa – sign language instructor, interpreter, psychologist.
mail: jezykmigowy@pitagoras.org.pl, psycholog@pitagoras.org.pl **phone:** +48 782 568 450

Link: https://www.pitagoras.org.pl/

- **RES-GEST Education and Support Centre**

A sports club for the deaf that also expands its activities in other areas: local educational, legal, psychological support, professional activation. Co-creates GlusiTV, one of the first and largest online televisions for the deaf in the country.
mail: kontakt@resgest.pl **phone:** +48 785 141 060

Links: https://www.resgest.pl/, https://www.glusi.tv/

- ***Experts:***

Dr. Małgorzata Czajkowska Kisil: CODA, educator of the deaf, teacher at the Institute of the Deaf in Warsaw. Lecturer at the Postgraduate Studies "Polish Sign Language" at the Faculty of Polish Studies, University of Warsaw. PJM interpreter and lecturer at the University of Warsaw.
mail: m.czajkowska@eduwarszawa.pl

Anna Antos: A deaf educator of the deaf, a certified teacher-librarian at the Educational and Upbringing Centre for the Deaf in Warsaw, an expert on professional advancement of teachers from the list of the Ministry of National Education and a court expert in lip-reading.
mail: biblioteka@oswg-wawa.edu.pl

Marcin Daszkiewicz: Deaf since birth, PJM lecturer at the University of Warsaw and lecturer of the thematic block "Deaf Culture" at the Postgraduate Studies "Polish Sign Language" at the Faculty of Polish Studies, University of Warsaw.

mail: plm@uw.edu.pl

Zuzanna Borowska: Deaf person, member of the Main Board of the Polish Association of the Deaf in Warsaw, where she supports the deaf community and promotes sign language. Boarding house teacher at a school for the deaf in Warsaw, where she is involved in the development of young deaf students. Runs PJM courses.

mail: cemn@pzg.org.pl

Piotr Tomaszewski Assistant professor at the Faculty of Psychology at the University of Warsaw. Teaches PJM grammar and examines the functioning of the Deaf community. Wrote a monograph on the linguistic analysis of the phonology of Polish Sign Language (PJM) and many scientific articles about the Deaf.

mail: piotr.tomaszewski@psych.uw.edu.pl

5.3 Italy

This section presents key organizations and professionals in Italy who are dedicated to advancing the inclusion and rights of deaf individuals through education, research, and professional development. Mauro Chilante and the IRSID LIS Onlus institute contribute to research and training in Italian Sign Language (LIS) and social inclusion. National associations such as the Italian Federation of Deaf Associations (FIAS) and the National Institute for the Protection and Assistance of the Deaf (ENS APS) advocate for equality, accessibility, and empowerment within the deaf community. Additionally, ANIOS, the Italian Sign Language Interpreters Association, plays a crucial role in ensuring interpreter quality and professionalism. Prominent figures like Angelo Raffaele Cagnazzo and Maria Luisa Franchi further exemplify leadership and commitment to linguistic accessibility and cultural recognition of the Deaf community in Italy.

- **Mauro Chilante**

LIS expert and instructor, he is the president of IRSID LIS Onlus, a research institute focused on Italian Sign Language (LIS), deafness, and welfare. Since 2020, he has also served as the coordinator of the Scientific Council of CORiFISI—an inter-university center for guidance, research, training, and social inclusion established by the four universities of Abruzzo (Chieti, L'Aquila, Teramo, and the Gran Sasso Science Institute). The center is dedicated to studying issues related to individuals with communication disorders.
mail: mchilante@unite.it

- **Italian Federation of Deaf Associations**

Re-founded in 2018, FIAS aims to actively collaborate with institutions, civil society organizations, and other stakeholders to promote inclusive policies and ensure access to services and resources necessary to guarantee equality and opportunities for deaf individuals.
mail: fias.sordi@gmail.com **phone:** +39 347 2900880

- **ENS APS (National Institute for the Protection and Assistance of the Deaf)**

This organization serves as a representative body and advocate for the moral, civil, cultural, and economic interests of deaf individuals in Italy, including those with additional disabilities. The mission of ENS is to promote the inclusion of deaf people in society, fostering their growth, autonomy, and full human development.

Link: www.ens.it
mail: protocollo@ens.it **phone:** 06398051

Website: https://www.ens.it/

- **Angelo Raffaele Cagnazzo**

President of the ENS, a deaf individual who uses sign language. He is actively involved in advocating for the inclusion of deaf people.
mail: angelo.cagnazzo@mef.gov.it

- **Maria Luisa Franchi**

Italian Sign Language interpreter, bilingual since birth. Since the 1980s, she has collaborated with the Institute of Cognitive Sciences and Technologies of the CNR in Rome. She is a trainer for interpreters, works with ANIOS (the Association of Italian Sign Language Interpreters), and with ENS (the National Institute for the Protection and Assistance of the Deaf). She was the interpreter who launched the first edition of TG1 LIS (the first Italian Sign Language news broadcast) on June 6, 1994.
mail: ml.franchi100@gmail.com **phone:** 335 7491139

- **ANIOS (Italian Sign Language Interpreters Association)**

Founded on June 17, 1987, ANIOS was established to give value to the role of Sign Language Interpreters and ensure their professionalism. A LIS interpreter is a professional with strong linguistic, cultural, and ethical competencies, and ANIOS guarantees the quality and continuous professional development of its members. The presence of adequately trained professional interpreters ensures the full inclusion of deaf individuals and provides them with high-quality interpreting services in any context.
ANIOS is a member of the European Forum of Sign Language Interpreters.
mail: info@anios.it

Website: https://aniosinterpreti.it

5.4 Austria

In Austria, several institutions and services actively support the inclusion and accessibility of deaf and hard-of-hearing individuals, particularly within higher education. Organizations such as Beratungsstelle für Gehörlose – Dolmetschzentrale and ÖGS.barrierefrei provide essential interpreting services, including both in-person coordination and free video relay support for everyday communication needs. Universities play a key role as well: GESTU Vienna and

GESTU-Graz offer tailored assistance to deaf and hard-of-hearing students, ensuring accessibility and academic success. Additionally, initiatives like IntegriertStudieren Linz at Johannes Kepler University and the Zentrum Integriert Studieren at the University of Graz promote inclusive education for students with all types of disabilities, strengthening Austria's commitment to equal opportunities in higher education.

- Helping with the organisation of sign language interpretation:

Beratungsstelle für Gehörlose – Dolmetschzentrale
Ing. -Etzel-Straße 67
6020 Innsbruck
Zerrin Türkmen
+43 676 782 66 28
dolmetschzentrale@gehoerlos-tirol.at

Website: https://beratungsstelle.gehoerlos-tirol.at/

- Offering short-term free sign language interpretation services via video chat for making/changing/confirming appointments or for inquiring information from hearing people:

Service-Center ÖGS.barrierefrei
Waldgasse 13/2
1100 WIEN, AUSTRIA
Website: https://www.oegsbarrierefrei.at/services/relay-service/ÖGS BARRIEREFREI Relay-Service

- Supporting deaf and hard-of-hearing students in all topics related to their studies

GESTU
Gußhausst. 27-29, Stiege 1, 3. Stock
1040 Wien
Link: https://www.tuwien.at/studium/student-support/gestu

- **GESTU-Graz**

Mandellstraße 9, 1. Stock
8010 Graz
Link: https://www.tugraz.at/studium/studieren-an-der-tu-graz/studieninteressierte/gestu-graz-gehoerlos-und-schwerhoerig-erfolgreich-studieren

- Supporting students with any kind of disability throughout their studies:

Johannes Kepler Universität Linz
IntegriertStudieren Linz
Mag.ª Andrea Petz
Altenberger Straße 69
4040 Linz
+43 732 2468 3757
andrea.petz@jku.at

- **Universität Graz**

Zentrum Integriert Studieren
Manuela Haupert
Universitätsplatz 3a, 1. OG (Liftebene 4)
8010 Graz
+43 316 380-2227
zis.sekretariat@uni-graz.at

5.5 Germany

Germany has a well-structured network of organizations and institutions supporting deaf and hard-of-hearing people. National associations such as the Deutscher Gehörlosen-Bund e.V. (DGB) and BHSA e.V. work alongside universities, accessibility offices, and technology companies to promote inclusion, provide interpreting services, and develop innovative accessibility tools like sign-language avatars and captioning systems.

National / umbrella organisations

- **Deutscher Gehörlosen-Bund e.V. (DGB)** — national association for deaf people; general contact & policy resources.
  Prenzlauer Allee 180, 10405 Berlin — info@gehoerlosenbund.de —
  Phone/WhatsApp: **0155–66 43 01 39**. (Deutscher Gehörlosen-Bund e.V.)

Website: https://gehoerlosenbund.de/

- **Bundesarbeitsgemeinschaft Hörbehinderter Studenten und Absolventen (BHSA e.V.)** — support & peer network for hearing-impaired students / graduates.

Website: bhsa.de

- ***Interpreter / regional dispatch & services (examples)***

Vermittlungszentralen / Regional interpreter dispatch centres — many Länder have central dispatch services; examples:

  - Sachsen-Anhalt Vermittlungsstelle (Magdeburg) — see DGB regional listing. **Website**: Deutscher Gehörlosen-Bund e.V.
  - Gebärdensprachdolmetschervermittlung (Bavaria / Paritätischer) — contact via local Parität offices. **Website**: oberfranken.paritaet-bayern.de

Student services / university support

- **studierendenWERK BERLIN — Beratung Barrierefrei Studieren** — offers advice on DGS interpreters and written interpreters; contact via studierendenWERK Berlin **Website:** stW Berlin
- **Studierendenwerke (local)** — every major city/region has a studierendenWERK with disability study advice (search "[your city] studierendenwerk barrierefrei studieren"). Example: Studierendenwerk Hamburg / Munich pages provide dedicated contacts. Website: stwhh.de

Companies / research centres (examples for tech partnership)

- **Charamel GmbH (Cologne)** — sign-language avatar and related projects (AVASAG / KGA). **Website:** charamel.com. Charamel
- **Xander Glasses** — Xander® captioning glasses vendor (see xanderglasses.com). **Website:** Xander Glasses

Research & datasets

- **SignAvatars / research groups** — contact via the SignAvatars paper authors / hosting institution (see arXiv / publications). **Website:** arXiv

5.6 Conclusions

This chapter brings together a network of key organizations, universities, and professionals in Spain, Poland, Italy, Austria, and Germany committed to promoting the rights and inclusion of deaf individuals. These contacts—ranging from national associations to interpreting experts and educational institutions—serve as essential points of reference for cooperation, consultation, and resource sharing. Their collective expertise strengthens cross-border

collaboration, supports inclusive policymaking, and contributes to advancing equal participation in education and society.

Note: By including people's phone numbers and email addresses, we run the risk of the information quickly becoming outdated, as these individuals may no longer be working at these institutions in the near future.

It would be a good idea to only include the websites and nothing else?

6. Useful Statistics and Information

This section presents an overview of national and institutional reports that examine the educational situation, accessibility, and broader social inclusion of deaf and hard-of-hearing individuals across several European countries. The collected materials—from Spain, Poland, Italy, Austria, and Germany—highlight key findings, statistical data, and policy measures that shape current practices in deaf education. Together, these reports provide essential insights into systemic challenges, progress achieved, and ongoing efforts to ensure equal educational opportunities and linguistic rights for the deaf community throughout Europe.

6.1 Spain

This study provides an in-depth analysis of the educational situation of deaf youth in Spain, examining the main barriers they face within the education system and the resources required to ensure equitable access to learning. It emphasizes the relevance of intermodal bilingualism—combining sign language and spoken language—as a foundation for inclusive education and underscores the need to strengthen accessibility measures, particularly through the provision of sign language interpreting and other support services.

- **Study on the Educational Situation of Deaf Youth in Spain**

Comprehensive study on the educational situation of deaf youth in Spain.
This report analyzes the barriers and needs of deaf students in the education system, highlighting the importance of intermodal bilingualism (sign language and spoken language) and the need for accessibility resources such as sign language interpreters.

Link: Results Report

6.2 Poland

This collection of Polish studies and reports offers a comprehensive overview of the evolution, current state, and challenges of deaf education in Poland. The works trace historical developments from early special education to modern inclusive and bilingual approaches, emphasizing the linguistic and social importance of Polish Sign Language (PJM). They include academic analyses, testimonies from deaf adults, and institutional reports addressing accessibility, educational barriers, and systemic gaps. Together, these sources highlight both progress and persistent inequalities in the Polish education system, underscoring the need for stronger language support, inclusive practices, and coordinated policies to improve the educational experience of deaf and hard-of-hearing students.

- **Patrycja Łatka – The image of Deaf education in Polish education,**

Zeszyty Naukowe Pedagogiki Specjalnej, nr 17 (2024)
The article analyses the development of education for deaf people in Poland – from the beginning of special education (Middle Ages) to the present day. It discusses sign language as a key element of language development, historical models of teaching (oralistic, bilingual), current challenges (insufficient language support) and postulates (introduction of bilingual education).

Link: https://znps.uken.krakow.pl/article/view/11415/10294

- **Katarzyna Plutecka – From Special Education to Inclusive Education - Changes in the Education of Deaf Students,**

Edukacja Elementarna w Teorii i Praktyce 15(3) (2020)
It presents the evolution of education for deaf students: special model → integrated → inclusive. It shows the perspective of parents, students and experts, emphasizes the benefits of inclusion, but also the difficulties in implementation (e.g. social moods, system gaps).

Link: https://czasopisma.ignatianum.edu.pl/eetp/article/view/1467

- **Karolina Ruta-Korytowska, Marta Wrześniewska-Pietrzak – The image of school and education for deaf students in Poland in the statements of deaf adults,**

Kultura i Wychowanie, 14(2), 55–71 (2018)
Based on the memories of deaf adults, the authors describe the realities of education in an oral school in the 1980s and 1990s. They point to mental and educational barriers caused by the lack of use of PJM, low language motivation and social consequences. They emphasize the importance of a bilingual model of education.

Link: https://ojs.ahe.lodz.pl/index.php/kultura_i_wychowanie/article/view/148/125

- **Report of the Office for the Disabled at the University of Warmia and Mazury in Olsztyn:**

It presents, among others, the number of deaf and hard of hearing students at the universities surveyed in the academic year 2018/2019, selected fields of study, forms of support, reported difficulties in the education process and others.

Link: https://bip.brpo.gov.pl/sites/default/files/Glusi_i_slaboslyszacy_na_Uczelni_wyzszej-analiza_ankiet-Uniwersytet%20Warmi%C5%84sko-Mazurski%20w%20Olsztynie.pdf

- **The report of the Supreme Audit Office "Education of deaf and hard of hearing children and youth".**

It presents an analysis of the education system in the context of adapting to the diverse needs of students with hearing disabilities.

Link: https://www.nik.gov.pl/plik/id,26970,vp,29769.pdf

- **Report of the Deaf Affairs Team at the Commissioner for Human Rights "The Situation of Deaf People in Poland".**

The document presents a comprehensive view of the lives of deaf people in Poland, taking into account many different sectors, including education and the situation at universities.

Link: https://www.senat.gov.pl/gfx/senat/userfiles/_public/k9/komisje/2016/kpcpp/materialy/raport_sytuacja_osob_gluchych_w_polsce.pdf

6.3 Italy

This collection of Italian studies and reports provides an overview of the prevalence, causes, and early detection of hearing loss in children, as well as the educational context for deaf students in Italy. It highlights that approximately 1–2 out of every 1,000 newborns are born with permanent hearing loss, with sensorineural impairments being the most common, and emphasizes the importance of early screening and intervention for language development. The materials also present national and global statistics on hearing loss, showing significant prevalence among the general population and older adults, and underline the need for prevention and awareness. Additionally, data on school populations indicate that deaf students represent a small but notable proportion of students, highlighting the importance of accessible education and targeted support.

- **Prevalence of Sensorineural Hearing Loss in Newborns in Italy:**

Today in Italy, approximately 1–2 out of every 1,000 newborns are born with a permanent hearing disorder, a condition far more common than others for which neonatal screening has been mandatory for years. According to estimates from the Lazio Region, where universal newborn hearing screening has been mandatory since 2013, 50–60 children are born each year with sensorineural hearing loss (i.e., a malfunction of the auditory system caused by an issue with the cochlea or auditory nerve).

Based on this data, there are around 2,000 minors with deafness in Lazio. On a national level, according to ISTAT, an average of 500 children are born each year with sensorineural hearing loss, and therefore there are approximately 23,000 minors with deafness in Italy. In 1 out of 4 cases, this degree of hearing loss is so severe that it hinders the normal development of language.

Link: https://sip.it/2020/03/03/disturbi-delludito-in-eta-pediatrica-come-individuarli/#:~:text=Per%20quanto%20riguarda%20il%20dato,paese%20sarebbero%20circa%2023%20mila.

- ***Hearing Loss in Children: Early Detection, Causes, and Developmental Outlook:***

In Italy, sensorineural hearing loss is a type of hearing impairment caused by damage to the cochlea or the auditory nerve, which prevents proper transmission of sounds to the brain. It can be unilateral or bilateral, and its causes include genetic mutations (50%), infections during pregnancy (such as cytomegalovirus or rubella), or birth complications.

It is classified by severity:

- Mild: 21–40 dB
- Moderate: 41–70 dB
- Severe: 71–90 dB
- Profound: over 91 dB

Newborn hearing screening is conducted within the first month of life using a non-invasive test called otoacoustic emissions (OAE). If no response is detected, further testing at a specialized center is recommended. False positives can occur due to external factors like earwax. A follow-up screening is advised at age 3. Some cases of sudden hearing loss may appear within 72 hours and require urgent medical attention. Parents often worry about school and socialization, but today there are advanced technologies, even for infants under 3 months, and early intervention (ages 0–3) enables normal language development, as most children with hearing loss have a healthy speech apparatus. The brain grows most rapidly in the first two years, making this a crucial period for language acquisition.

Link: https://www.micuro.it/enciclopedia/prevenzione/screening-nascita-sordita

- **Global and National Hearing Loss Statistics:**

According to experts, 5% of the global population, around 430 million people, live with hearing loss. The World Health Organization (WHO) estimates that by 2050, approximately one in four people will experience some form of hearing impairment. In Italy, 7 million people

have hearing problems, which corresponds to 12.1% of the population. The incidence increases with age; in our country, hearing loss affects one in three people over the age of 65. Therefore, it is advisable to consult your trusted doctor for regular check-ups. Unfortunately, only 31% of the population has had a hearing check-up in the last five years, while 54% have never had one. These data highlight that there is still much work to be done in terms of prevention and awareness, especially because, as reported by the WHO, over 60% of hearing problems can be identified and addressed at the primary care level.

Link: https://www.ens.it/3-marzo-2023-giornata-mondialde-delludito/?doing_wp_cron=1746811208.4741590023040771484375

- **Deaf student in school:**

The frequency of deaf students among the total student population ranges from 0.04% to 0.06%. This means that for every 10,000 students, there are between 4 and 6 deaf students. On average, there is 1 deaf student for every 2,000 students.

Link: https://www.liberidisentire.it/cosa-facciamo/ricerca/progetto-scuole/#:~:text=la%20frequenza%20degli%20alunni%20sordi,alunno%20sordo%20ogni%202000%20studenti.

6.4 Austria

This selection of Austrian reports and statistical resources provides a detailed overview of the situation of students with disabilities, chronic illnesses, and health impairments, with a particular focus on those with hearing loss. It includes analyses of accessibility and support measures in higher education, evaluations of training programs for Austrian Sign Language (ÖGS) interpreters, and statistical data on the prevalence and projected development of hearing loss both in Austria and internationally. Collectively, these sources offer insights into the needs of students with hearing impairments, the effectiveness of institutional support, and broader demographic trends relevant for planning inclusive educational policies and services.

- Research Report (December 2020) ***"Zur Situation behinderter, chronisch kranker und gesundheitlich beeinträchtiger Studierender"*** (the situation of students with disabilities, chronical illnesses and health issues) in forms of statistical data - the Student Social Survey was conducted by the Institute for Advanced Studies (IHS)

  Link: https://irihs.ihs.ac.at/id/eprint/5603/1/ihs-report-2020-zaussinger-kulhanek-terzieva-unger-gesundheitliche-beeintraechtigung.pdf

- Final Report (December 2020) ***"Inklusive Hochschulen"*** (Accessibility in Higher Education) describing existing support for students with disabilities and health issues – the Student Social Survey was conducted by the Institute for Advanced Studies (IHS)

  Link: https://irihs.ihs.ac.at/id/eprint/5557/1/ihs-report-2020-wroblewski-englmaier-meyer-inklusive-hochschulen-zusatzstudie-sozialerhebung.pdf

- Final Report (November 2024) ***"Ausbildungsangebots zur/zum ÖGS-Dolmetscher/in"*** (Training programs for Sign Language Interpreters in Austria) – the evaluation was conducted by 3s research laboratory (www.3s.co.at)

  Link: https://www.bmbwf.gv.at/dam/jcr:38245000-2726-41cf-a6e7-2231e2f8053e/20250204_oegs_evaluierungsstudie_endbericht.pdf

- ***Statistics on people with hearing loss (2015)*** – worldwide and Europe by country available for download in various data formats (graph) provided by Statista based in various countries worldwide.

  Link: https://www.statista.com/statistics/736529/people-with-hearing-loss-worldwide-and-europe-by-country/

- ***Forecasts/Statistics on the development of numbers of people with disabling hearing loss with explaining comments***

  Links: https://www.statista.com/statistics/888666/number-of-people-with-hearing-loss-worldwide-select-countries/
  https://www.statista.com/statistics/888569/number-of-people-with-hearing-loss-worldwide-projections/
  https://www.statista.com/statistics/888654/number-of-people-with-hearing-loss-worldwide-projections-by-region/
  https://www.statista.com/statistics/670158/hearing-loss-prevalence-in-select-developed-countries/

6.5 Germany

This practical checklist provides universities with a comprehensive roadmap for implementing accessible and inclusive teaching practices for deaf and hard-of-hearing (DHH)

students, integrating insights from the ISENSE project. It covers accessibility audits, policy publication, and clear procedures for booking interpreters and captioning services, as well as procurement of hybrid solutions, including AR caption glasses and lecture capture with time-coded captions. The roadmap emphasizes co-design with DGS-native signers and deaf students, staff training on inclusive pedagogy, and compliance with data protection regulations. Evaluation through student feedback and collaboration with commercial vendors and research initiatives, such as Xander Glasses, AVASAG, and academic AR captioning projects, is recommended to ensure effective, user-centered implementation.

- **Practical checklist for universities (implementation roadmap) including the ISENSE project**

1. Audit & policy
    - Carry out an accessibility audit (digital and physical).
    - Publish an accessibility statement (including DGS options for key pages). (OpenAble)
2. Establish clear procedures
    - Create fast-track booking for interpreters and CART for registered students.
    - Define *Nachteilsausgleich* workflows and centralized contact points (exam office + disability services). (Kunstuniversität Düsseldorf, FHM Prüfungsordnung)
3. Procure hybrid services
    - Budget for human interpreters/CART for core teaching.
    - Pilot AR caption glasses for pilot students (evaluate latency, readability, GDPR).
    - Invest in lecture capture + high-quality time-coded captions.
      Link: Computer Science U of T
4. Co-design & training
    - Involve DGS native signers and deaf students in procurement and testing (co-design).
    - Provide staff training, as planned within the ISENSE project, on inclusive teaching practices (microphone technique, slide design, speaking pace).
      Link: DW Innovation
5. Data protection & procurement safeguards
    - Ensure microphone recording, cloud ASR services and avatar providers comply with GDPR and institutional data policies.
6. Evaluation
    - Collect periodic feedback from DHH students and adapt services.

- **Selected commercial vendors & research projects (examples)**

1. Xander Glasses (Xander) — commercial AR captioning glasses.
   Link: Xander Glasses
2. Charamel / AVASAG — German company + research consortium building DGS avatars for public services (project AVASAG). Useful for municipal text-to-sign applications and research collaboration.
   Link: Charamel
3. Academic AR captioning projects: SeEar, HMD caption latency/edge-compute prototypes, and multi-modal AR research (useful partners for pilots).
   Link: ACM Digital Library
4. SignAvatars dataset / SLP research — major academic dataset enabling 3D sign language avatar development (researchers / potential collaborators).
   Link: arXiv

6.7 Conclusions

The data analyzed and reports from across Europe offer valuable insight into the realities of deaf and hard-of-hearing individuals within education systems. They reveal both persistent challenges—such as inconsistent language support and accessibility gaps—and encouraging progress in areas like early intervention, bilingual programs, and technological aids. Overall, the findings highlight the importance of coherent policies, sustained funding, and inclusive frameworks to promote equal learning opportunities and greater participation for deaf students in European education.

3 7. General Conclusions

The data and documents received from partners across the ISENSE consortium countries provide a comprehensive and detailed overview of legislation, linguistic rights, educational materials, useful contacts, and technical studies related to the education of deaf people. The information collected through the project demonstrates that significant progress has been made toward improving accessibility and inclusion for deaf individuals, particularly through laws recognizing sign languages and promoting communication support measures.

Likewise, the data gathered show that each country has specific regulations and resources for the educational inclusion of deaf students, including national laws and decrees, pedagogical guides, sign language dictionaries, educational portals, bilingual education initiatives, interpreter and guide-interpreter training programs, as well as active organizations supporting the deaf community.

The identification of good practices in university-level training for interpreters and guides, together with the analysis of the educational situation and the needs of deaf students, provides a solid foundation for comparative studies and knowledge exchange. Documents such as this one, therefore, serve as valuable reference sources for gaining an initial understanding of where to turn when seeking to study or explore further the situation and opportunities offered by the European educational system for people with hearing disabilities.

From our perspective, and after successfully achieving the objectives set by the ISENSE project, the consortium believes that the next steps should focus on strengthening cooperation among countries, promoting the exchange of good practices, and supporting the development of harmonized strategies at the European level.

If these efforts are pursued, they would not only enhance accessibility within each national context but also contribute to building a more inclusive European educational environment for deaf and hard-of-hearing individuals.