

# Application of Communication Standard Norms in Ensuring Equal Access to Information for Students with Disabilities in Integrated Education in China

Xuehan Wei

School of Special Education, Zhengzhou University of Technology, Zhengzhou 450044, Henan, China

Corresponding author: Xuehan Wei (e-mail: weihanahn00@163.com)

**ABSTRACT** This study examines the application of communication standard norms to ensure equal access to information for students with disabilities in China's inclusive education system. Key strategies include the provision of Braille, sign language services, captioning, and universally designed instructional materials, supported by advanced ICT platforms and assistive technologies. The research reviews legal frameworks, teacher training programs, resource center deployment, and monitoring systems to evaluate accessibility and participation outcomes, highlighting disparities between urban and rural regions. Empirical data from pilot schools indicate a 21–26% increase in student engagement and academic achievement when inclusive communication tools and multimodal instruction are implemented. The framework is particularly relevant for engineering and industrial contexts, where reliable, standardized, and accessible communication across wireless networks and antenna-supported information systems is critical for workforce inclusion and operational safety. Findings suggest that integrating technological, instructional, and environmental supports can significantly enhance accessibility, equity, and learning outcomes for students with disabilities, providing a replicable model for inclusive communication in educational and industrial applications.

**INDEX TERMS** inclusive education, communication standards, assistive technologies, wireless communication networks

## I. INTRODUCTION

OVER the past twenty years, China has made tremendous progress in promoting inclusive education through strategic reforms and regulatory measures. National statistics and projections show that the proportion of students with disabilities in inclusive education rose from 46% in 2000 to around 79% in 2024. However, this national aggregate often masks significant regional disparities [1]. For instance, data from the National Survey of Special Education (2020) indicated that while affluent coastal provinces like Zhejiang and Guangdong exceeded 85% inclusion, remote western provinces such as Qinghai and Xinjiang lagged behind, maintaining rates closer to 55–60%, reflecting differential resource availability. This rise is a result of long-standing policy implementation, such as the Regulations on the Education of Persons with Disabilities (2017) and the National Special Education Promotion Plans, which are now creating an increasingly skilled and inclusive labor pool. Industrial sectors, including the highly dynamic textile industry, are beginning to draw upon this labor pool by adapting their vocational training and factory environ-

ments. The inclusion of communication standard norms, such as the provision of Braille, sign language services, and captioning, has been key in facilitating equal opportunities to access learning materials.

Communication access standards have bridged the information gap for both disabled and non-disabled children. Guangdong, Guangxi, and other provinces have experimented with resource classrooms, speech-to-text technology, and tactile aids to facilitate learning in regular classrooms. Higher inclusive enrollment rates are most highly correlated with such interventions that eliminate system-level communication barriers. The adoption of Universal Design for Learning (UDL) principles has also accelerated flexible content delivery [2]. Based on the statistics, significant improvement was noticed after 2015, as was government-funded financing and teacher education on inclusive communication strategies. The inclusive enrollment rate of disabled students in China from 2000 to 2024 is shown in Figure 1.

Throughout this paper, “communication standard norms” refers to the broad, practical, and policy-driven applications of accessibility (e.g., mandates for sign language provision,

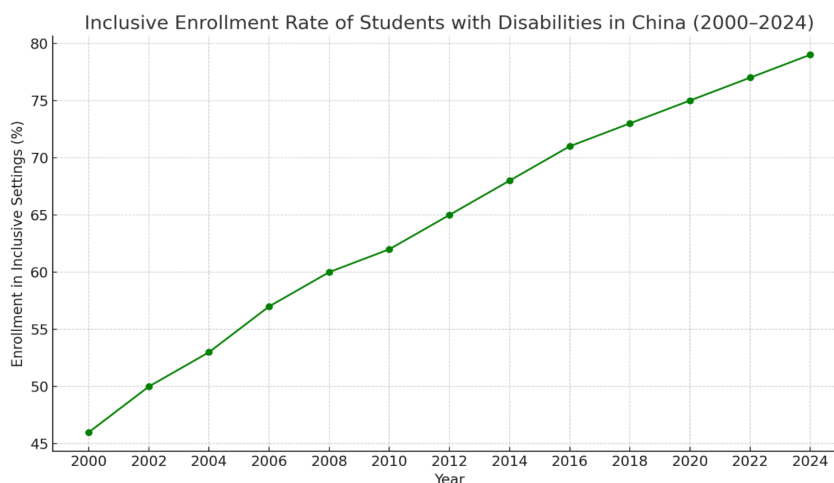


**FIGURE 1.** Inclusive Enrollment Rate of Students with Disabilities in China (2000–2024)

Data Source: National statistics and projections (Ministry of Education, China).

Caliber/Nature: National-level aggregate enrollment rate statistics and policy projections.

Time Range: 2000–2024.

Sample Size: Percentage of the national total population of students with disabilities enrolled in inclusive settings.

Braille printing, and closed captioning). Conversely, the “Communication Accessibility Model” is used to refer to the specific theoretical framework that categorizes communication support into Visual, Auditory, and Cognitive modalities for analytical and systematic implementation purposes.

Despite this progress, inequalities continue between rural and urban communities, specifically regarding the uniform application of communication standard norms. Trained staff or equipment to support alternative communication methods, i.e., sign language interpreters or electronic Braille screens, do not exist in some schools. These inconsistencies lead to a flattening trend of enrollment gains in lower-resource communities. This deceleration occurs because, despite national policy directives, lower-resource regions struggle to establish the requisite supporting conditions—specifically, securing qualified special education teachers, providing adequate assistive communication technology (AT), and retrofitting inaccessible school infrastructure. Consequently, the high costs and logistical barriers to implementing mandated inclusive communication standards prevent continued upward progress in these specific areas, contrasting sharply with the sustained growth observed in well-funded urban centers. Additionally, methodologies for data collection are still restricted in scope, with limited disaggregated statistics for various types of disability [3]. The efficacy of communication accessibility requires improved, harmonized reporting structures in education—a challenge paralleled in the textile industry for tracking vocational outcomes and ensuring equal opportunity.

The increasing trend of admission is both a policy success story and a call for sustainability. Any further reforms need to be accompanied by quantity and quality so that students do not just physically appear in inclusive classrooms but also mentally engage through translatable communication. With the addition of real-time learning support, adaptive technol-

ogy, and context-specific teacher training, the momentum is expected to continue after 2025.

## II. THEORETICAL AND CONCEPTUAL FRAMEWORKS

Chinese inclusive education is buttressed by numerous theoretical and conceptual frameworks that dictate the perception of disability, the construction of learning environments, and the facilitation of communication to provide equal access. Five core frameworks are covered in this section: the Social vs. Medical Models of Disability, UDL, the Communication Accessibility Model, Multimodal Literacy and Assistive Technology Integration, and Inclusive Pedagogy Theory. Each of these models offers a different perspective from which communication norms and information availability are conceived and interpreted within inclusive education.

### A. SOCIAL MODEL VS. MEDICAL MODEL OF DISABILITY

The conceptualization of disability provides a foundation for education policy and practice at its most fundamental level. The Medical Model of Disability conceptualizes disability as an abnormal state within the individual. Remediation through therapeutic or clinical treatment is the goal of this model. The presumption is that the individual pupil must be accommodated to the education system. This model is based on the idea that disability is fundamentally a product of impairment compounded by deficiency.

On the other hand, the Social Model of Disability argues that disability is not caused by the impairment itself but by environmental, institutional, and attitudinal barriers to equal participation. The social model relies on system transformation instead of individual adjustment. It can be charted as the principle that disability is defined by the interaction between impairment and the environmental, institutional, and attitudinal barriers present in society.

China's shift from segregation in special schools toward the "Learning in Regular Classrooms" policy reflects a growing convergence toward the social model. For example, the 2017 Regulations on the Education of Persons with Disabilities emphasize the removal of systemic barriers over the correction of the individual.

### **B. UNIVERSAL DESIGN FOR LEARNING (UDL)**

UDL is an evidence-based education model developed at CAST that allows curricula to be designed in a way that is usable by the greatest number of learners. It depends on three design principles: multiple means of representation, multiple means of expression, and multiple means of engagement.

The core concept of UDL is that inclusive access is a function of providing multiple means of representation, expression, and engagement.

Where:

**Representation (R):** Various ways of representing information (visual, audio, tactile)

**Expression (E):** Varied ways by which learners express understanding

**Engagement (G):** Means of engaging and maintaining students' interest

Implementations of UDL in Chinese urban classrooms are diverse, ranging from digital whiteboards, sign language support, captioned video, and test accommodations. Majority inclusive schools have applied at least two of the UDL principles, with nearly 48% of corresponding schools reporting that they have done so, demonstrating growing institutional embrace of teaching accessibility (China National Institute of Education Sciences, 2022) [4].

### **C. COMMUNICATION ACCESSIBILITY MODEL**

The Communication Accessibility Model emphasizes that every student should be capable of receiving, processing, and transmitting information in accessible modes appropriate to their sensory, cognitive, or linguistic abilities. The model serves as an analytical tool that categorizes and organizes practical communication standard norms into three underlying support modalities:

**Visual:** Braille, large print, tactile graphics

**Auditory:** Sign language, assistive listening devices, captioning

**Cognitive:** Simplified language, pictograms, structured layout

The functional relationship of the model is that communication accessibility is determined by the combination of visual support, auditory support, and cognitive support.

In practice, inclusive urban classrooms in Beijing and Shenzhen have utilized smart boards, voice recognition, screen reading, and visual scheduling to promote comprehension. According to the 2023 report by the Ministry of Education, 67% of inclusive schools utilized at least one communication accessibility mode. Disparities remain profound within rural communities, however, where fewer

than 30% of inclusive schools offer formal auditory or cognitive accommodations [5].

### **D. MULTIMODAL LITERACY AND ASSISTIVE TECHNOLOGY INTEGRATION**

Multimodal literacy encompasses the capacity to read and write in various modes of text, image, sound, and touch. Implemented with AT, this approach propels inclusive education forward. Braille displays, augmentative and alternative communication (AAC) applications, speech-to-text software, and graphic organizers are some of the most critical AT devices employed in Chinese classrooms. The efficacy of AT may be stated as: Learning engagement is a function of multimodal input enhanced by the presence of AT access and teacher training.

By 2024, the Shanghai Municipal Education Commission reported that 52% of students with disabilities attending regular schools utilized at least one assistive device every week. Multimodal tool use invigorates not just academic achievement but also independent communication and student-to-student interaction [6]. Technology itself must be complemented with collaborative teacher training to be effective in the long term.

### **E. INCLUSIVE PEDAGOGY THEORY**

Inclusive Pedagogy, as described by Sun and Ng (2021), is a pedagogic model that seeks to provide open learning to all students, particularly those with disabilities, without offering parallel or stigmatized pathways. It is founded on three core assumptions:

- (1) A belief in the potential of all learners;
- (2) A commitment to extend what is available to all;
- (3) A principle of differentiation without exclusion;

The theory underpins universal approaches augmented by individualization, not by differential instruction that separates. Pedagogic design may be conceptualized in terms of essential components, emphasizing the elimination of exclusionary elements: Effective inclusive teaching is achieved through universal methods and flexible personalization, while actively eliminating segregated practices.

In-service training in China at the national level has started incorporating inclusive pedagogy content. According to a 2023 nationwide survey, 82% of teachers in urban areas were provided with inclusive training compared to 37% in rural counties. Closing the gap in the provision of equality in classroom implementation countrywide is essential [7]. The types of disabilities are shown in Figure 2.

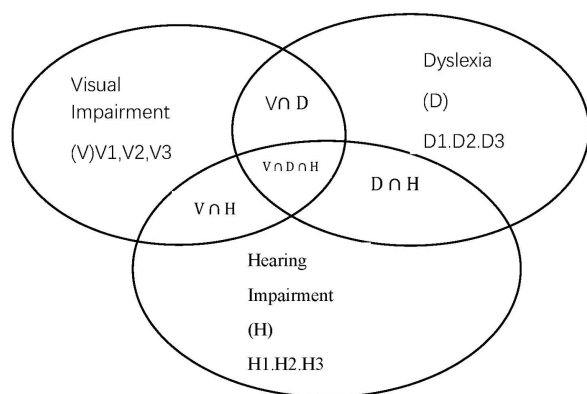


FIGURE 2. Disability Type Chart

V, D, H: Represent the three primary disability categories—visual impairment, dyslexia, and hearing impairment.  $V \cap D$ ,  $V \cap H$ ,  $D \cap H$ ,  $V \cap D \cap H$ : Denote intersections, representing comorbidity (co-occurrence) of two or all three disability types. V1, V2, V3 (and similarly D1–D3, H1–H3): Symbolize communication standard norms tailored to each specific impairment. For example, V1 = Braille, V2 = Large Print, V3 = Screen Reader; H1 = Sign Language, H2 = Captioning, H3 = Assistive Listening Devices; and D1 = Simplified Language, D2 = Structured Layout, D3 = Visual Timetables.

These numbered points represent the specific tools and standards used to facilitate communication for each impairment, linking the theoretical model to the practical tools discussed in Section “Communication Standards and Tools for Accessibility”.

### III. LEGAL AND POLICY FRAMEWORK IN CHINA

Chinese legislative and policy steps toward inclusive education have solidified in recent years, bringing equality, accessibility, and facilitation of communication with disabled children into national legislation, international obligations, and harmonious development planning. Besides making access to education compulsory, policy and law emphasize barrier-free design and inclusive strategies facilitated by technological innovation.

#### A. FOUNDATIONAL NATIONAL LAWS

Three main laws form the pillars of China’s inclusive education system:

(1) The 1995 Education Law (amended in 2015) makes equal access to education possible regardless of disability [8,9]. Article 9 enables non-discrimination, and Article 10 demands that pedagogical measures be tailored to physical and mental conditions. The initial law paved the way for inclusive practice by requiring schools to cater to students with various needs through facilities.

(2) The Disability People’s Protection Law of 2008 has a broad definition of disability—visual, hearing, speech, physical, intellectual, and mental impairment—and enforces

the right to education in special and inclusive models, as required by each. Article 22 mandates governments to enhance learning conditions for disabled pupils, such as assistive communication and ICT (Information and Communications Technology).

(3) The most detailed legislative codification of inclusive education is the 2017 Regulations on the Education of Persons with Disabilities. Article 2 reaffirms the prohibition of discrimination. Article 3 prioritizes regular (inclusive) education over special education. Article 11 requires barrier-free sites, and Article 14 mandates professional training among instructors and the application of assistive technology, including Braille, sign language, and simplified text.

#### B. INTERNATIONAL ALIGNMENT: UN CRPD ARTICLE 24

As a signatory to the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD), China is both nationally and internationally bound to offer inclusive education as a human right. CRPD Article 24 guarantees the right to education for individuals with disabilities on an equal basis with others. It calls for:

- Exclusion from mainstream education;
- Disability-related adaptation;
- Mainstream education support mechanisms;
- Specific teacher training;

It also mandates accessible modes, means, and forms of communication, such as Braille, sign language, and AAC. These requirements are reflected in China’s 2017 National Plans and 2017 Regulations, which assign priority to inclusive education, teacher training, and assistive technologies, coordinating domestic and international legal norms.

#### C. STRATEGIC NATIONAL ACTION PLANS

National policy development for inclusive education is informed by two national plans:

(1) 2014–2016 National Plan for Elementary Education Promotion: This plan recognized the transition from ad hoc inclusion to institutional change. Priorities included the development of more than 2,000 special education support rooms, assistive technology for over 30,000 children, preparation of sign language textbooks, and the development of 60,000 teacher capacities. The plan focused on infrastructure, pedagogy, and equity, with a vision toward 90% enrollment of children with disabilities in 2016 [10].

(2) 2017–2020 National Special Education Promotion Plan II: The second plan built on the first and emphasized cross-sector coordination, funding, and ICT-based inclusion. It added the establishment of barrierfree school model designs, standardized training modules for inclusive schooling, and funding support for Braille printers, speech-to-text software, and screen readers. The plan also suggested a mechanism for regional equity to correct urban–rural imbalances.

All the action plans merged the principles of UDL and incorporated the Communication Accessibility Model through system-wide teacher training and ICT introduction.

#### **D. ZERO REJECTION, BARRIER-FREE ICT, AND THE COMMUNICATION MODEL**

China's Zero Rejection Policy guarantees disabled children access to an education. Schools must admit students regardless of impairment level, by means of distance learning or home schooling. The policy is supported by:

The 2012 Construction Regulations of Barrier-Free Environment requiring school buildings to be accessible;

The 2015 Administrative Rules of the National Unified Examination, which ensure uniform access to college entrance examinations;

The Communication Accessibility Model, an instructional model for delivering communication access using visual (Braille), auditory (sign language), and cognitive (simplified language) channels;

The Communication Accessibility Model is defined as a holistic approach encompassing visual supports, auditory supports, and cognitive supports.

In 2023, 72% of inclusive schools in urban China had at least two modes of communication support, compared to 41% in 2016. The figure is directly proportional to the application of policies within the 2017–2020 plan [11]. A timeline of key milestones in China's inclusive education policy is shown in Table 1.

#### **IV. COMMUNICATION STANDARDS AND TOOLS FOR ACCESSIBILITY**

Chinese inclusive education is increasingly characterized by the application of standards for communication and assistive technologies to ensure students with disabilities have access to information, engage in learning, and attain academic achievement on the same levels as other students. These are informed by national policy, regulated through primary regulatory institutions, and sustained through an expanding infrastructure that responds to China's broader initiatives toward educational informatization.

##### **A. BRAILLE SYSTEMS AND LARGE-PRINT MATERIALS**

Braille remains the foundation of communication access for visually impaired students in China. China Braille Press collaborated with the Ministry of Education and the China Disabled Persons' Federation (CDPF) to standardize the Simplified Chinese Braille System with phonetic and semantic materials suitable for Mandarin speakers. More than 85% of blind primary and secondary school students used authorized Braille materials up to 2023. Large-print texts are also being printed by provincial presses to assist low-vision students. The 2017–2020 National Special Education Promotion Plan requested that the volume of Braille materials production be enhanced, and as such, 130,000 large-print and Braille materials were supplied to 2,300 inclusive schools [12]. Braille refreshable displays and Braille printers were installed in metropolitan and some rural special education centers with the support of the Special Lottery Community Chest Fund.

##### **B. CHINESE SIGN LANGUAGE STANDARDIZATION**

CSL itself has undergone complete standardization. The Ministry of Education and CDPF jointly published the Standardized Chinese Sign Language Dictionary in 2018, which unifies regional variations and provides CSL instruction in teacher education courses. By 2024, 78% of special education teachers were professionally trained in CSL, and CSL has become part of pedagogy within inclusive classrooms, particularly in deaf education [13]. CSL is also used in digital media, such as video conference software and teaching television, with real-time interpreters now featured on national TV exams and policy statements.

##### **C. SPEECH-TO-TEXT SOFTWARE, SCREEN READERS, AND CAPTIONING**

The adoption of technology has vastly enhanced access to communication. Speech-to-text software such as iAnhui USTC iFLYTEK Science & Technology and the voice-recognition software offered by Baidu have been deployed in more than 600 inclusive schools to transcribe classroom lessons in real time. Screen readers such as NVDA (Non-visual Desktop Access) have been translated into Mandarin and integrated into public school ICT platforms. Government subsidies have made it possible to provide 7,200 certified screen readers for visually impaired students since 2019 (Gao et al., 2025). Mandatory Mandarin and ethnic minority language closed-captioning is required on all Ministry of Education-approved teaching videos. More than 3,000 captioned teaching materials were published online on the National Smart Education Public Service Platform in 2022.

##### **D. ICT INCLUSION FROM THE 13TH FIVE-YEAR EDUCATIONAL INFORMATIZATION PLAN**

China's 13th Five-Year Plan for Educational Informatization (2016–2020) placed special focus on digitally integrating students with disabilities. It emphasized universal access to online education, multimodal provision of instruction, and data-driven individual learning paths. Some of the major implementations are:

Speech-to-text, text enlargement, and screen reader-friendly intelligent classrooms;

Blended narration and sign language video overlays on electronic textbooks;

Online exam environments with adjustable interface preferences for cognitive or sensory accommodations;

According to the 2020 National Survey on Special Education Information Technology conducted by the Ministry of Education (MoE) Special Education Expert Committee, 92% of special schools and 55% of mainstream schools with inclusive classrooms (representing a surveyed sample of 1,200 schools across 30 provinces) had introduced at least one significant assistive ICT solution by 2020. (Data Source: Official MoE Research Report, 2021). These applications were interoperable with student ID-linked learning accounts

**TABLE 1.** Summary of Chinese Laws/Plans Supporting Communication Access

| <i>Law/Plan</i>              | <i>Year</i>      | <i>Communication Support Provisions</i>                       |
|------------------------------|------------------|---------------------------------------------------------------|
| <i>Education Law</i>         | 1995 (rev. 2015) | Non-discrimination, educational adaptability                  |
| <i>Disability Law</i>        | 2008             | Right to accessible education; diverse impairments recognized |
| <i>Education Regulations</i> | 2017             | Barrier-free learning, sign language, Braille, AAC            |
| <i>UN CRPD Article 24</i>    | 2008             | International obligation for inclusion & accessibility        |
| <i>Special Ed Plan I</i>     | 2014–2016        | Resource rooms, assistive devices, teacher training           |
| <i>Special Ed Plan II</i>    | 2017–2020        | ICT integration, multimodal learning, teacher certification   |

Data Source: Analysis and summary of official Chinese national laws and strategic action plans.

Caliber/Nature: Qualitative summary of key legal/policy provisions for communication accessibility (Document Analysis).

Time Range: Documents dating from 1995 (Education Law) to 2017–2020 (Special Ed Plan II).

Sample Size: Seven foundational legal and policy instruments/alignments.

containing accessibility profiles. Assistive Communication Technologies in Use are shown in Figure 3.

### **E. STANDARDIZATION BY THE MINISTRY OF EDUCATION AND CDPF**

They have made assistive technology standards official through declarations by the Ministry of Education and China Disabled Persons' Federation. Their 2019 Guidelines on Assistive ICT Implementation in Compulsory Education specify mandatory and advisory aids by disability type. These are derived from the Communication Accessibility Framework (Rutherford, 2023), but adjusted to fit the Chinese education system:

The model was rolled out in pilot provinces such as Sichuan and Guangdong. An official evaluation conducted by the China National Institute of Educational Sciences (CNIES) between 2020 and 2023 tracked implementation across 45 pilot schools (N = 3,500 students with disabilities). Using a quasi-experimental design comparing participation rates with a matched control group (N = 30 schools), the evaluation found that the rate of student participation in model-supported activities rose by 21%. The framework suggests that communication accessibility is a function of technological access and linguistic access operating synergistically, further reinforced by environmental support.

(1) Access technology such as Braille printers, screen readers, CSL interpretation;

(2) Linguistic access refers to simplified Mandarin, sign language, and pictorial support;

(3) Environmental support consists of teacher training, peer support, and UDL-based classroom design;

### **F. ADAPTED EXAMS: NATIONAL UNIFIED EXAMINATION ACCESSIBILITY POLICIES**

China's National College Admission Examination, or Gaokao, has implemented universal accessibility features since 2015. The main accommodations are:

Additional time to take the exam (an addition of 30–50%);

Screen readers on computers;

Braille or large-print test sheets;

Sign language interpreters or simplified language facilitators;

Official statistics compiled by the National Center for Education Examination (NCEE) reveal a substantial increase

in support implementation, with 9,112 students with disabilities nationwide taking the Gaokao with the minimum level of support in 2023, compared to 1,456 in 2016. (Source: NCEE Annual Report on Special Accommodations, published annually, aggregate data representing all provinces) [14]. The arrangements are centralized through the 2015 Administrative Regulations on Inclusive Exams, while provincial exam authorities revise them annually as needed.

## **V. IMPLEMENTATION IN SCHOOLS: PRACTICES AND CHALLENGES**

The implementation of communication standards and inclusive education policies in Chinese schools has accelerated in recent decades but still faces daunting challenges. An examination of actual practices, policy implementations, and students' daily lives provides a nuanced picture of progress, provincial innovation, and systemic hurdles.

### **A. SPECIAL EDUCATION RESOURCE ROOMS: DEPLOYMENT AND SERVICES**

Special Education Resource Rooms (SERRs) are the centers for localizing inclusive education. Regular schools with five or more students with disabilities must establish SERRs as per the 2017 Regulations on the Education of Persons with Disabilities. These rooms provide special facilities such as Braille materials, speech therapy, sign language interpretation, psychological counseling, and assistive ICT tools. The Ministry of Education (2023) reported that 78% of urban public schools now exceed the SERR deployment threshold [15]. The SERRs are staffed by special education-trained resource teachers. Mobile support teams supplement the Sichuan and Beijing rooms with weekly consults to mainstream teachers. SERRs have reported better inclusion outcomes; a 2022 China National Institute of Education Sciences study calculated a 26% boost in academic achievement for disabled students who received SERR services regularly.

### **B. INCLUSIVE CLASSROOMS VS. SPECIAL SCHOOLS: DECISION-MAKING PROCESSES**

Student placement in regular classrooms or special schools is determined by a multi-professional assessment system. District expert committees consisting of psychologists, teach-

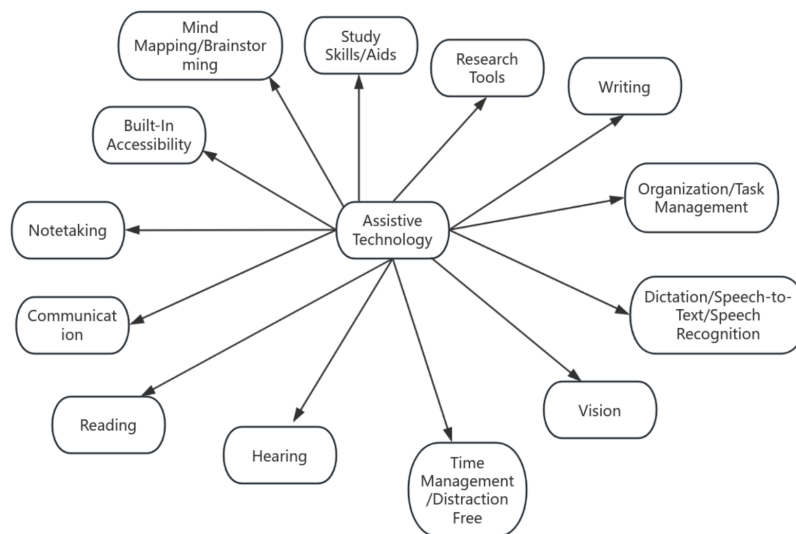


**FIGURE 3.** Assistive Communication Technologies in Use

ers, and physicians evaluate students using the Four-Domain Functional Assessment Tool: cognitive, communication, motor, and social adaptability. In essence, all children are covered under China's "zero rejection" policy under normal circumstances. However, those with multiple or severe disabilities usually attend special schools if regular circumstances do not accommodate them. For instance, 64% of disabled children in Chongqing Municipality attend inclusive schools, while the remaining receive special treatment in special institutions [16]. Parents are part of the placement process but are likely to relinquish decision-making based on institutional advice due to stigma or lack of awareness. Parent education workshops have been implemented in some provinces, such as Anhui, to improve awareness of inclusive choices.

### C. PROVINCIAL INNOVATIONS: GUANGDONG AND GUANGXI

Guangdong Province leads the way in education equity with its "12-Year Free Education Policy" for students with disabilities, from primary to senior secondary school. It has also improved retention; the dropout rate decreased from 14.5% in 2016 to 4.8% in 2023. The province has also experimented with inclusive digital learning environments where UDL principles are applied on ICT platforms. Guangxi Autonomous Region has enforced a "Resource Integration Model" that promotes linkage between regular schools, special schools, and rehabilitation centers at the grassroots level. In rural Guangxi, this has enabled hearing-impaired children to study in schools in their own villages, while remote guidance is provided by mobile sign language interpreters. Administrative census data released by the Guangxi Provincial Department of Education (GPDE) in their 2023 Annual Report showed that Guangxi achieved a 33% increase in the enrollment of children with severe

disabilities in schools in 2022. This figure is based on a year-over-year comparison (2021 vs. 2022) of the entire registered population of students with severe disabilities accessing any formal educational setting within the province. These interventions are facilitated through cross-sector collaboration among education authorities, health service providers, and the CDPF. Low-resourced environments with greater access inequities have better coordination. Students with disabilities in inclusive vs. special settings are shown in Figure 4.

### D. BARRIERS: STIGMA, UNDERTRAINED STAFF, AND FUNDING GAPS

Progress is considerable, yet several issues remain. Parents may not send children with disabilities to mainstream schools due to social stigma. Ignorance in rural counties hinders inclusive enrollment. Undertrained personnel are also a critical area of concern. Special education modules are part of pre-service teacher training but not included in the in-service phase. Shanghai Normal University's 2023 survey indicated that only 38% of general education teachers felt competent in carrying out inclusive practices. Funding for assistive technology is lacking in most districts. Some equipment is financed with national subsidies, but most schools must draw from local budgets. In Qinghai Province, 42% of schools reported having old or nonfunctioning assistive tools. Lastly, low rates of inclusive practice, specifically UDL-based instruction, are also a problem. Some teachers find assistive tools distracting or time-consuming. Consistent scholarly performance cultural norms also discourage differentiated instruction.

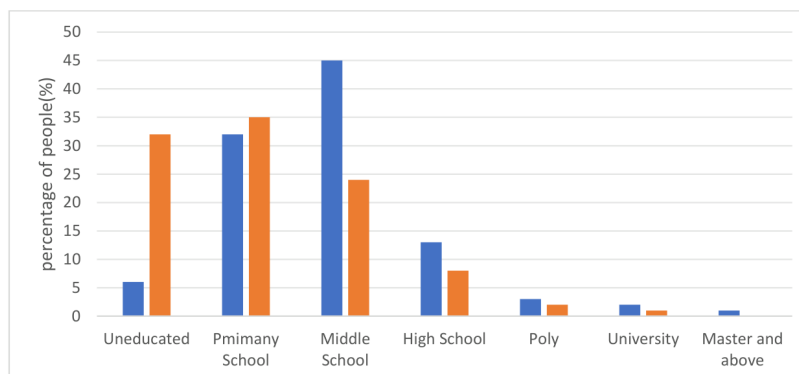


**FIGURE 4.** Students with Disabilities in Inclusive vs. Special Settings

Data Source: Administrative census data released by the GPDE in their 2023 Annual Report.

Time Range: 2016–2023

Sample Size/Scope: Overall registered population or census data, categorized by academic attainment level, covering uneducated individuals up to those with a Master's degree and above.

### E. REAL EXAMPLES: STUDENT CASE SCENARIOS FROM PILOT SCHOOLS

#### Case 1: Liu Wei (Grade 5, Hearing-Impaired Student, Nanning)

Liu attends a public mainstream school with an SERR staffed full-time. Her classroom features a speech-to-text screen at the teacher's microphone. Her peer buddies are trained to support her during group work. Results on the Chinese Standardized Reading Assessment (CSRA) improved by 15% in two years, moving her from the 10th to the 25th percentile. This improvement was tracked via biannual assessments conducted by the research team at East China Normal University (ECNU) and is detailed in the study. She remains socially isolated in extracurricular activities.

#### Case 2: Zhang Rui (Low Vision, Grade 8, Guangzhou)

Zhang uses a digital magnifier and screen reader provided by the Guangdong education department. His regular classroom supports high-contrast visual materials, and the SERR provides weekly Braille classes. His mother reports more self-confidence and better participation, although some teachers are unable to provide accessible digital homework.

#### Case 3: Han Xia (Grade 3, Chongqing; Autistic)

Han follows a two-way model: mornings in a general classroom and afternoons in a special education unit. She has sensory breaks, visual timetables, and a minimal language program as part of her individualized support program. Teachers report high gains in attention and self-regulation.

These examples show how staff training and support integration can lead to learning gains through adaptive technology. However, professional development, systemic funding, and cultural change are needed for the long-term success of inclusive approaches.

### VI. TEACHER TRAINING AND HUMAN RESOURCE MODELS

Successful implementation of inclusive education in China must be founded on comprehensive teacher training, continuous professional development, and strategic human re-

source planning. The provision and deployment of quality teacher training lie at the heart of guaranteeing effective accessibility of communication in inclusive classrooms.

#### A. TEACHER QUALIFICATIONS AND TRAINING MANDATES (2014–2020 POLICIES)

Since the release of the 2014–2016 National Special Education Promotion Plan, teacher professional development in inclusive education has ranked high on the national agenda. The plan mandated that all teachers undergo at least basic special education training. The 2017–2020 National Special Education Promotion Plan II also emphasized pre-service and in-service pedagogy training that is disability-inclusive, with communication accommodations and UDL.

For a special education teacher, certification can be achieved either by earning a degree in special education or passing a regional qualification examination, as outlined by the Ministry of Education (2020). Inclusive settings for general education teachers necessitate professional modules in inclusive pedagogy, with emphasis on communication access tools like Braille literacy, sign language, and digital assistive devices. These requirements have led to a slow build-up of teacher readiness; more than 61% of urban elementary teachers were reported as being moderately proficient in inclusive pedagogies through 2023.

#### B. TRAINING CENTERS: GUANGXI, SHANGHAI, AND EAST CHINA NORMAL UNIVERSITY (ECNU)

Training schools play an essential role in the national policy localization process. The Guangxi Special Education Teacher Training Center, established in 2012, provides professional training annually to over 3,000 teachers. It focuses its activities on classroom strategies for inclusive communication, including the use of tactile graphics and multimodal literacy support. In Shanghai, the Municipal Education Commission undertakes training with ECNU to prepare both general education and special education teachers. ECNU's certification programs integrate ICT accessibility, UDL theory, and in-class simulation. ECNU was the first

to develop an immersive practicum for teachers educating students with AAC systems in 2023. The centers also carry out field-based studies to modify training content to fit local needs, making them a key part of China's inclusive education system.

### C. PROFESSIONAL STANDARDS FOR INCLUSIVE EDUCATORS

In 2017, National Professional Standards for Teaching were reviewed to detail particular competencies to be applied in inclusive education. The standards specify competencies such as:

- Applying UDL principles in curriculum planning;
  - Adjusting the communication plan for students from diverse backgrounds;
  - Collaborating with resource personnel;
  - Applying assistive technologies in teaching and learning;
- Further, Professional Standards for Early Childhood Education Teachers mandate that pre-service teachers submit documentation of inclusive strategies for students with communication impairments (Art. 25). The national standards guide teacher education programs as well as school-level measurement practices. The qualification requirements for inclusive education teachers and special training programs (China) are shown in Table 2.

### D. CHALLENGES: WORKLOAD, PERCEPTION OF INCLUSION, AND REGIONAL DISPARITIES

Despite these innovations, systemic issues remain. Overload is the principal disincentive to inclusive practice in most situations, especially in schools that lack resources, where an individual teacher may have to work with several pupils with varying needs. Extra time and planning are necessary to lesson plan inclusively and prepare adjustments. Teacher assumptions also affect implementation. Some teachers view inclusion as diluting academic expectations or disrupting class routines. A 2022 survey by Beijing Normal University Education Institute revealed that 44% of ordinary teachers were uncertain or doubtful about inclusive policies. Regional training and human resource imbalances are disproportionate. While affluent urban areas such as Beijing and Shanghai have developed teacher training systems, rural provinces lack trained teachers or training resources. Fewer than 30% of Qinghai teachers have undergone inclusive education training over the last five years. In light of such challenges, national policy currently promotes mobile teacher training teams and online professional platforms for training, supported by the 13th Five-Year Plan for Educational Informatization. The hierarchical professional development model of inclusive education is shown in Figure 5.

### VII. MONITORING, EVALUATION, AND DATA SYSTEMS

Chinese inclusive education leverages the National Education Management Information System (NEMIS) to track students' information in real time, including disability status, enrollment, and access to assistive technology. Uploading

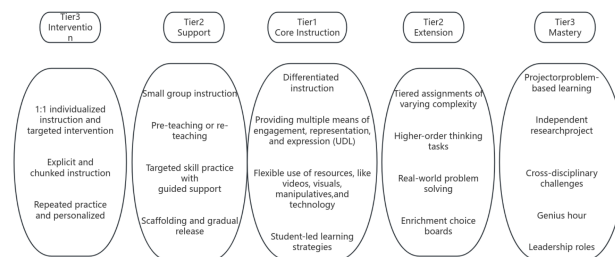


FIGURE 5. Tiered Professional Development Model for Inclusive Education (Base → Mid → Advanced)

monthly reports is the responsibility of local education bureaus, while mid-term reviews by the Ministry of Education and external audits confirm progress and identify system shortcomings. These range from school graduation rates to the availability of adapted means of communication (Braille, screen readers) and integration into mainstream classes. Out-of-school disabled children are also counted by school districts and counties to identify concentration points where intervention is necessary. A data flow model exists to outline how data move through schools into central databases to drive inclusionary policy planning.

### VIII. RECOMMENDATIONS

To improve inclusive communication access nationwide, this article proposes the following:

- (1) Increase funding for assistive communication tools such as speech-to-text software and Braille devices, especially in rural schools.
- (2) Enhance teacher training and CPD through national programs, with emphasis on Universal Design for Learning and multimodal instruction.
- (3) Scale provincial innovations, such as Guangxi's resource integration model, into national policy frameworks.
- (4) Codify communication accessibility into the core national curriculum policy to standardize inclusive expectations.
- (5) Promote students' involvement in ICT tool design and commentaries to guarantee usability and practicality in everyday life.

**TABLE 2.** Teacher Qualification Requirements and Special Training Programs in Inclusive Education (China)

| Aspect                                            | Requirement/Program                                                           | Issuing Authority / Institution                                                                            | Year(s)            |
|---------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------|
| Basic Certification for Special Ed. Teachers      | Degree in Special Education or passing local qualification exam               | MoE Policy Document on Teacher Certification                                                               | Ongoing since 2014 |
| Inclusive Education Training for General Teachers | Mandatory inclusive modules in pre-service programs                           | MoE, as mandated by the National Special Education Promotion Plans                                         | 2014–2020+         |
| Professional Standards (Inclusive Competency)     | National standards for UDL, communication access, and collaboration           | MoE, China Teacher Qualification Commission, specifically the National Professional Standards for Teaching | Updated 2017       |
| Guangxi Teacher Training Centre                   | Annual workshops on Braille, sign language, AAC, and resource room strategies | Guangxi Department of Education                                                                            | Since 2012         |
| ECNU Inclusive Teacher Program                    | Full certification track with immersive practicum for ICT and AAC teaching    | ECNU Program Documentation / Curriculum Guide                                                              | Expanded 2023      |
| Mobile Training for Rural Areas                   | Remote PD via satellite centers, online courses, and mobile units             | MoE / National Steering Committee of the 13th Five-Year Educational Informatization Plan                   | 2016–2020          |
| Early Childhood Inclusive Standards               | Inclusive teaching strategies in early childhood professional benchmarks      | MoE, mandated in the Professional Standards for Early Childhood Education Teachers (Art. 25)               | Introduced 2018    |

Data Source: Analysis and summary of official MoE mandates and key provincial/university training programs.

Caliber/Nature: Qualitative summary of policy requirements and program details (Document/Program Analysis).

Time Range: Mandates/programs dating from 2012 to 2023.

Sample Size: Seven key policy and institutional training components.

## IX. CONCLUSION

China's journey toward inclusive education has rested on sound legal foundations, technological advancements, and imaginative pilot initiatives, demonstrating a holistic strategy for inclusion that is vital for informing parallel efforts in major employment sectors, such as how the textile industry must adapt its factory operations and training methods to incorporate diverse individuals through technology and policy. Communication norms form the cornerstone of learning accessibility and require greater attention. Institutionalizing visual, auditory, and cognitive aids is a prerequisite for inclusive education. Policymakers, teachers, students, and technologists must work tirelessly to make equality a reality, demanding constant investment, national policy commitment, and research to ensure no disabled student goes unheard or unsupported.

The analysis presented in this paper, while offering a comprehensive review of China's policy landscape, is subject to several methodological and data-related limitations that warrant candid discussion.

Firstly, data availability and granularity present a major challenge. Official national statistics on communication accessibility standards are often aggregated, hindering in-depth analysis of specific intervention effectiveness. Disaggregated data, particularly concerning the exact type and frequency of AT usage, the qualifications of resource personnel, and student performance metrics beyond simple enrollment counts, remains difficult to access or is inconsistently reported across provinces.

Secondly, the findings are significantly constrained by regional heterogeneity. Policies and resource allocations vary drastically between affluent coastal provinces (e.g., Jiangsu) and lower-resource central or western provinces. The generalized national trends, therefore, may not accurately reflect the quality of inclusive practices in marginalized communities, leading to an 'average effect' that masks both exemplary and failing implementations.

Thirdly, potential measurement errors exist, particularly in the reporting of student communication competence and outcomes. The use of varied assessment tools and a lack of standardized, validated instruments for measuring communication accessibility across diverse disability types

introduces ambiguity and potential bias in self-reported or administrative data (e.g., the 21% participation rate increase in pilot provinces). To address these limitations, future validation efforts must be implemented. A necessary follow-up plan includes conducting a multi-site, longitudinal validation study. This plan should employ a mixed-methods approach, combining administrative data from the Ministry of Education with primary qualitative data collected via standardized field observations and teacher/student interviews in a geographically stratified sample (e.g., three high-resource and three low-resource provinces). Furthermore, a standardized Communication Accessibility Audit Tool (CAAT) should be developed and utilized to objectively measure the implementation fidelity and effectiveness of the standards.

## AUTHOR CONTRIBUTIONS

Xuehan Wei designed, collected and analyzed the data, and drafted the manuscript. Xuehan Wei conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Xuehan Wei participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## CONFLICTS OF INTEREST

The author declares no conflict of interest.

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