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## REVIEW OF THE USE OF SIGN LANGUAGE IN THE SYSTEM OF INCLUSIVE EDUCATION AND TRAINING

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**Abstract.** Knowledge is an infinite world. In this endless world, everyone strives to get what they need. Everyone believes that knowledge is the basis for improving their lives. Such people are children with special educational needs. Now the opportunities have expanded, as a result of which the concept of inclusive education and inclusive learning has been formed. Inclusive education represents a critical strategy for enhancing educational systems globally. A systematic literature review has been conducted to assess the current state of inclusive education and identify existing gaps. The primary objective of this research is to explore the application and effectiveness of sign language recognition systems within inclusive education frameworks. To achieve this goal, two specific tasks were addressed: first, to examine the practice of inclusive education, including the identification of unique learning characteristics and needs of Deaf or Hard-of-Hearing (DHH) students; and second, to evaluate the experience and impact of integrating sign language recognition technologies into the educational experiences of individuals with hearing impairments. This includes a detailed consideration of contemporary technological advancements. Through this exploration, the research aims to provide a comprehensive understanding of how modern technologies can be leveraged to enhance inclusive education and improve outcomes for students with diverse needs. Further studies could build on these findings to advance the development and implementation of such technologies in educational settings.

**Keywords:** Inclusive education, deaf, sign language, recognition system, equal opportunity education, inclusive learning, special educational needs, technology integration in education

### Introduction

The law of the Republic of Kazakhstan on inclusive education “ensuring the activities of educational, social protection of the population, healthcare organizations that provide special social, medical and educational services to children with disabilities, ensuring the creation of conditions for overcoming and compensating for the restriction in life and aimed at creating opportunities for them to participate in the life of society equally with other citizens” [1] is given.

The United Nations (UN) states party noted that the convention on the rights of persons with disabilities [2] has the right to inclusive education on an equal basis with all exceptional people, as specified. In order to implement this right and on the basis of equality of opportunity, States Parties shall ensure inclusive education and lifelong learning at all levels.

Inclusive education has become one of the most current tendency in the modern world, which many international organizations committed to educating people with disabilities are trying to promote in various educational institutions worldwide.

Inclusive education is a form of training that allows everyone, regardless of the existing physical, social, emotional, mental, linguistic, intellectual and other characteristics, to study in general education institutions.

The system of inclusive education includes educational institutions of pre-school, secondary, vocational and higher education. Its goal is to create an environment for training and professional training of people with disabilities without barriers. This set of measures implies the technical equipment of educational institutions, as well as the development of special training courses for teachers and other students aimed at developing interaction between children with disabilities. In addition, special programs are needed aimed at simplifying the process of adaptation of children with disabilities to a general education institution.

Creating all the conditions for the education, development and upbringing of children with special characteristics in our society is the main prerogative of law. It is very important to protect the rights of children belonging to this group, because they are souls like us, and they have the right to live on equal terms. It is necessary to strictly monitor the process of providing people with features with a good education system, because obtaining education is the most important step in a person's life.

Thus, the purpose of a systematic review of the literature is to identify the features of the use of the sign language recognition system in inclusive education.

To achieve this goal, the tasks were set to analyze and summarize existing knowledge and research on the topic in order to identify the main trends, advantages, limitations and recommendations regarding deaf and hard of hearing students and the use of modern technologies in inclusive education.

To carry out this analysis, the following questions were compiled:

- 1) What are the defining features of inclusive education for the hearing impaired?
- 2) What are the experiences and challenges of using sign language recognition systems in educating the hearing impaired?
- 3) What types of modern technologies are available to support communication for Deaf and hard of hearing?

### **Materials and Methods**

This systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

## 2.1 Inclusion and exclusion criteria

As part of the systematic review, the following inclusion and exclusion criteria were used

Table 1 - The eligibility criteria

Inclusion criteria	Exclusion criteria
Subject area: social	Non-social
Document type: articles	Other types of documents: books, conference materials, etc.
Publication stage: final	In progress
English language	Not in English
Source type: Journals	Other source types: book series, conference proceedings, trade publications
Published between year 2019 to 2023	Published prior to 2019

At the beginning of the systematic review, we applied the basic eligibility criteria. Such as:

- 1) The range of published articles was set from 2019 to 2023.
- 2) We choose English because most of the articles were in English.
- 3) We excluded the conference materials; we did not use the word “systematic” as a search term in this study.

## 2.2 Search strategy

When compiling systematic reviews, we were guided by the recommendations of PRISMA (the Preferred Reporting Items for Systematic Reviews and Meta-Analyses) .

The systematic review included the following successive stages:

- 1) Search and identification of relevant publications on the specifics of using the sign language recognition system in inclusive education.
- 2) Assessment by inclusion and exclusion criteria.

Relevant publications were screened in December 2023 in the Scopus database. The following search query was used for keywords such as “inclusive education”, “deaf”, “sign language”, “recognition system”. The query operator can be listed as follows:

- 3) Analysis of the quality of the selected publications and compliance with the requirements.

A literature search revealed 602 articles from the Scopus database. We limit our search to the last 5 years because technology is changing very fast. In addition, we have additionally applied the inclusion and exclusion criteria. For example, we chose English, and also limited the search results to only journal articles and articles published between 2019 and 2023. We used Scopus, [www.eric.ed.gov](http://www.eric.ed.gov), [dsel.education.gov](http://dsel.education.gov) and in some cases websites to search. As a result, we got a total of 28 valid entries. Figure 1 summarizes the process of selecting articles for the purpose of this study.

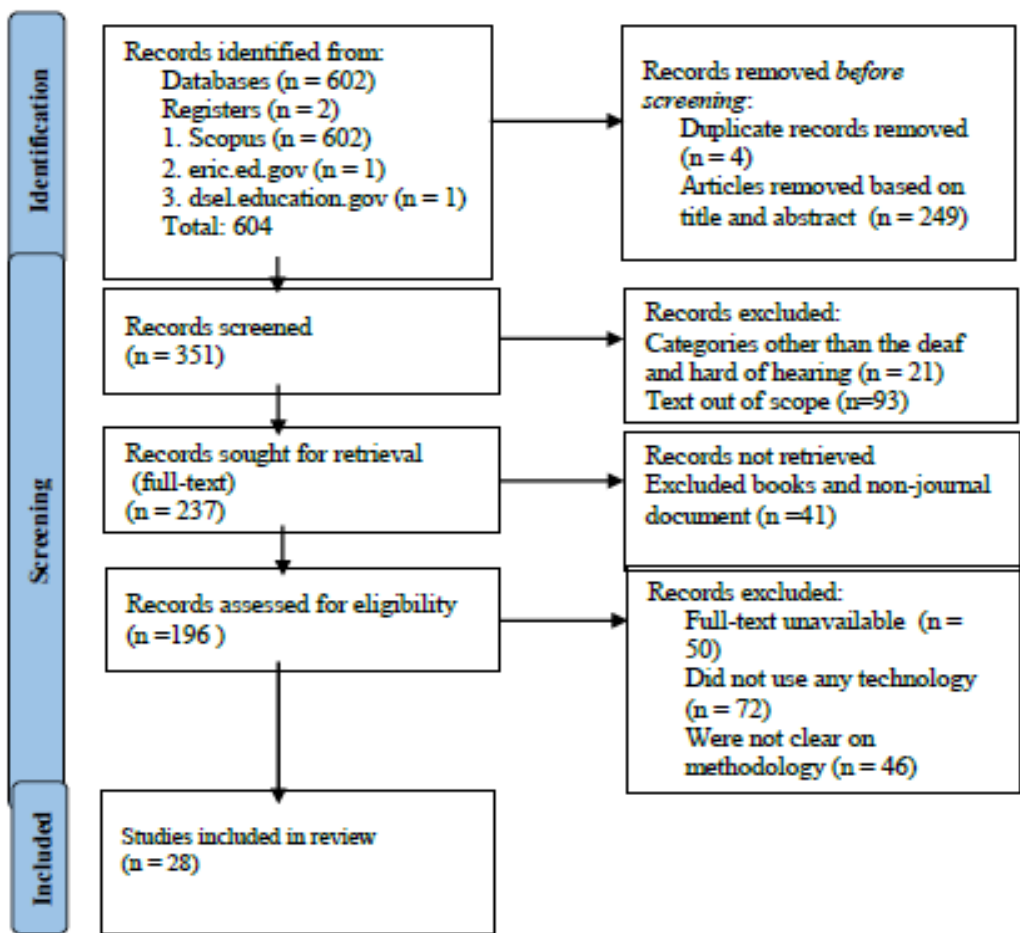


Fig. 1 - PRISMA flowchart summarizing the identification and selection process

2.3 Selection process

The records were exported to an MS Excel spreadsheet. Two independent researchers independently reviewed the titles and annotations of the records and materials. Two researchers then conducted an acceptance assessment by carefully reviewing the full text. The texts of the remaining articles were reviewed independently. At this stage, any disagreements were resolved through discussions between the co-chairs until a consensus was reached. If agreement could not be reached, the opinions of the third researcher would be taken into account. We included all the review articles that showed to some extent that the methods they used to identify and select literature were clear, reproducible, and did not contain a priori assumptions about the relevance of the selected literature.

Results

The development of inclusive education has been included in the legislation

by many countries, attributing it to important state issues. In particular, if we consider the history of the beginning of the practice of inclusive education in the countries of the world.

Table 2 - Legislation for Inclusive Education

Country	Year started	Legislation	Purpose	Reference
Belgium	1970	The adoption of the law on special and inclusive education in 1970 led to conditions in which children had the right to attend special schools, as well as to organize various levels of Education.	This law defines special educational institutions for people with special educational needs and home training is recommended.	[3]
China	In 1987, inclusivity was formulated, Started in 1995	Education Act and Disability Protection Act	The law stipulates that children with mild to moderate disabilities can attend and study in regular schools with normally developing children.	[4]
Ireland	1998	Section 7 of the Education Act 1998	The law emphasizes the inclusiveness and equality of access, including the provision of disabled people or other special educational needs, and establishes the right of parents to send their children to the school of their choice.	[5]
Italy	1971	The integration of students with disabilities began with law 118/1971, which gave all children the right to study in general classes.	The meaning of this law gives the right to education for all children, in classes with children with disabilities.	[6]
Kazakhstan	2002 11 July No. 343	The Law «On Social and medical-pedagogical correctional support for children with disabilities», dated July 11 2002 No. 343	Chapter 4 of Article 15. The rights of children with disabilities. 5) Children with disabilities have the right to receive free education in special educational institutions or state general educational institutions in accordance with the conclusion of psychological, medical and pedagogical consultations.	[7]
Malaysia	1996	Inclusive education was introduced in the Education Act in 1996 as part of a continuum of services available to children with special needs.	The purpose of this document is to discuss the interpretation of policy on inclusivity, its contradictions and its practical implementation in the Malaysian context; and to share experiences on how the national context interprets and limits inclusive practice.	[8]

In the field of education, educational organizations for children and adolescents with special needs keep records of attendance. As of 2021, in the Republic of Kazakhstan, according to the National Educational database, there are 20% kindergartens (1232 out of 6159) that have fulfilled the conditions of Inclusive Education; 60%-general education schools (4207 out of 7014 schools); 30%-educational institutions of technical and vocational education (250 out of 821 colleges) [9]

Most hearing-impaired inclusive children have the intellectual potential to achieve high achievement, but today the situation is not fully established so that many states can raise or use their intellectual potential in the educational process. The main objective of professionals is that children from kindergarten to 12th grade, with special characteristics especially inclusive, we must increase our academic success in family, social and educational contexts.

In Sweden, the National Curriculum clearly provides for equal education for any individual, regardless of gender, class and ethnic origin. Education must be adapted to the conditions and needs of each student. The rights of students to receive special education are spelled out in government decrees. If it is assumed that the student will not achieve the goals set, then he has the right to receive a special education. Special education is provided in a regular class or student group, but support may be provided in a special group if necessary in special cases. The task of the teacher is to ensure and support the development of an individual curriculum for students in need of special training. The main goal should be to create cooperation between the teacher, student and his parents.

The National Education Policy for 2020 in India states that “education is the only major means to achieve social justice and equality”, which affects the development of an inclusive community and society as a whole. It was noted to create a fair and inclusive education society that would introduce aspects of the integration of children with special needs and address proposals to address issues, challenges and gaps that would reduce inequality in the access and participation of all students.

The Turkish Ministry of Education defines the concept of the rules of inclusive education and special education as follows. Inclusive education is the practice of special education based on the principle of teaching people with special educational needs in formal and private schools, who freely continue their education together with their peers without disabilities at the level of preschool, primary, secondary and adult education. we need support in education.

In Canada, it is believed that every child has the right to education in the usual school system. Students need support in an environment that allows them to learn according to their abilities. Students with disabilities should not be isolated from the total number of students in “special classes”. Therefore, in the environment of peers of the same age, they are entitled to individual support that



allows them to receive inclusive education and study. Inclusive education benefits all those involved. Diversity, social acceptance, altruism, empathy, understanding are some of the benefits that can be given to students with and without disabilities who study in an inclusive environment .

Educational practices of the states of Sweden, India, Turkey and Canada the role of inclusive education in fulfilling social justice, equality and diversity is very important. It is known that today the essence of inclusive education in many countries of the world is an increasing desire to provide equal educational opportunities for all students, including children with special educational needs. Therefore, the involvement of children with special needs in the educational system will undoubtedly benefit not only the students themselves, but also the entire society. This highlights the importance of further development and improvement of inclusive practices in global education.

### **Discussion**

New technologies should serve human values . Currently, artificial intelligence-enabled tools are being developed to make education more inclusive, and they have been reviewed by the authors. For example, Authors who automatically describes the content of the images to them by voice [10]. Technologies that convert speech into sign language to help people with visual impairments or hearing impairments . This technology is used as an auxiliary tool for people with special educational needs. Digital technology allows you to eliminate barriers by introducing international standards for digital access to online education. [11] these studies examined various works related to the development of teaching materials and the topic of modern technologies aimed at students with hearing impairments of distance learning platforms.

A study by [12] looked at sign language across a neural network in India, examining the relationship between hard of hearing people and the rest of society, and focused on bridging the interaction gap.

[13] the following articles show the use of different platforms in the training of people with hearing impairments. For example, ecosystem mechanisms that support innovative learning are shown.. The design of a platform for providing medical services to people with hearing impairments is provided. In addition, a platform for learning sign language, dedicated to communication issues and accessibility between the deaf and their parents. The universal learning design was designed to support the diversity of students and described its positive effects and challenges it faced.

[14] this document prove that the use of virtual and augmented reality in inclusive education is a very relevant topic.

Numerous studies (see Table 3) show that advanced technologies have a decisive influence on the development of inclusive education.

Table 3 - The results of a systematic review carried out using the PRISMA guidelines

Innovative Technology	Country	Description	Innovative Technology	Country	Description
Translation tool	Pakistan	Translation speech and text to bilingual subtitles	Online course	United States	Improvements to online courses for deaf and hard of hearing students (DHH)
Distance learning platform	Egypt	Delivering educational content from a distance	Online resource	Thailand	Development media technology skills in DHH
Internet resource	Saudi Arabia	Studying sign language for preschool teachers	An intelligent system	Egypt	Translation Arabic sign language into speech
Visual materials	Turkey	Teaching vocabulary to deaf students	Education application	Indonesia	Development lip-reading educational application
Accessibility-oriented player	Spain	Accessibility-focused player for DHH	Universal Design for Learning	United States	Developing a learning environment for inclusivity
Machine learning	United States	Creating scalable datasets on sign language	A real-time hand gesture recognition system	India	Accessible interacting with computer for deaf user
Machine learning	Malaysia	Translation gestures of deaf people into text format	Mobile application	Pakistan	Teaching basic math to deaf children
Software	Spain	An interactive platform for learning sign language	A smart learning application prototype	Italy	Learning Italian sign language
British sign language recognition system	United Kingdom	Contactless British sign language recognition system	Augmented Reality(AR)	Thailand	Productiveness of books with augmented reality for hearing impairments
Finger gesture recognition	United States	Text entry utilizing a virtual keyboard for deaf people	A platform for communication in sign language	Mexico	Creating an inclusive healthcare environment for deaf individuals
Storybook application for tablets	United States	A collection of short stories for young learners	e-learning system	Egypt	Utilizing gamification techniques in learning for deaf students
Online SL translator	Australia	Creating effective online sign language translations	Automatic translation	Brazil	Automatic translation based on avatars
Deep learning	India	Automated sign language identification system	Multimedia content making	Brazil	Analyzing videos created by deaf people
Radio frequency sensor	United States	Detection of sign language with sensors	Speech recognition technology	China	Creating a learning database for deaf students



As a result of the review, material was obtained from which it can be concluded that technology plays an important role in the education of the deaf and hard of hearing.

### Conclusion

One of the main problems in teaching children with hearing impairments and hearing impairments is the need to create conditions for living with normal children and treating them equally. Today, the number of children with hearing impairments and hearing loss is growing sharply. A lot of work has been done on the development of the inclusive education system in the Republic of Kazakhstan. In particular, in recent years, a number of changes have been made to regulatory legal acts. For example, the category of children with hearing impairments and hearing impairments, including those in need of special education, has been expanded.

The problem of inclusive education is currently relevant and in demand in pedagogical theory and practice, we need to fully contribute to the professional training of children with disabilities, their inclusion in the environment as individuals.

Inclusive education should be accessible to all people in need, including children with special educational needs, and be institutions that provide them with special conditions and the necessary social and psychological pedagogical support for sustainable improvement of general education.

Children with special needs can not only be involved in the educational process, but also get an idea of the future, where there is a chance to master a certain profession and find a suitable job or profession.

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## ИНКЛЮЗИВТІ БІЛІМ БЕРУ МЕН ОҚЫТУ ЖҮЙЕСІНДЕ ЫМ ТІЛНІҢ ҚОЛДАНЫЛУЫНА ШОЛУ

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**Аңдатпа.** Білім – шексіз әлем. Осы шексіз әлемде әркім өзіне керегін алуды көздейді. Әр адам өз өмірін жақсартуға негіз болатын білім екеніне сенеді. Сондай жандар ерекше білім беруді қажет ететін балалар. Қазір мүмкіндіктер аясы кеңейді, соның нәтижесінде инклюзивті білім мен инклюзивті оқыту ұғымы қалыптасты. Инклюзивті білім беру жаһандық деңгейде білім беру жүйелерін жетілдірудің негізгі стратегиясын ұсынады. Инклюзивті білім берудің қазіргі жағдайын бағалау және бар олқылықтарды анықтау үшін әдебиеттерге жүйелі шолу жасалды. Бұл зерттеудің негізгі мақсаты инклюзивті білім беру контекстінде жестау тілін тану жүйелерінің қолданылуы мен тиімділігін егжей-тегжейлі зерттеу болып табылады. Осы мақсатқа жету үшін екі негізгі міндет қойылды. Біріншіден, оқудың бірегей ерекшеліктерін және саңырау немесе нашар еститін оқушылардың қажеттіліктерін анықтауды қоса алғанда, инклюзивті білім беру тәжірибесін зерттеу қажет. Екіншіден, бұл технологиялардың есту қабілеті нашар адамдардың білім беру жетістіктеріне қалай әсер ететінін түсіну үшін жестау тілін тану технологияларын білім беру процесіне біріктірудің тәжірибесі мен әсерін бағалау маңызды. Бұл тұрғыда инклюзивті білім беруді жақсарту үшін инновациялық шешімдерді қалай пайдалануға болатынын тереңірек түсінуге мүмкіндік беретін заманауи технологиялық

жетістіктерді мұқият қарастыру жүргізілуде. Алынған нәтижелер негізінде білім беру мекемелеріне осындай технологияларды дамытуға және енгізуге бағытталған әрі қарайғы зерттеулер үшін ұсыныстар ұсынуға болады, бұл өз кезегінде инклюзивті білім беру ортасын құруға және әртүрлі қажеттіліктері бар оқушылардың оқу нәтижелерін жақсартуға ықпал етеді.

**Тірек сөздер:** инклюзивті білім беру, саңырау, ымдау тілі, тану жүйесі, тең мүмкіндікті білім беру, инклюзивті оқыту, арнайы білім беру қажеттіліктері, технологияны білімге енгізу

## **ОБЗОР ИСПОЛЬЗОВАНИЯ ЯЗЫКА ЖЕСТОВ В СИСТЕМЕ ИНКЛЮЗИВНОГО ОБРАЗОВАНИЯ И ОБУЧЕНИЯ**

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**Аннотация.** Знание-бесконечный мир. В этом бесконечном мире каждый стремится получить то, что ему нужно. Каждый человек верит в то, что знания являются основой для улучшения его жизни. Такие люди-дети с особыми образовательными потребностями. Сейчас расширились возможности, в результате чего сформировалось понятие инклюзивного образования и инклюзивного обучения. Инклюзивное образование представляет собой ключевую стратегию для совершенствования образовательных систем на глобальном уровне. Для оценки текущего состояния инклюзивного образования и выявления существующих пробелов был проведен систематический обзор литературы. Основной целью данного исследования является детальное изучение применения и эффективности систем распознавания жестового языка в контексте инклюзивного образования. Для достижения этой цели было поставлено две основные задачи. Во-первых, необходимо изучить практику инклюзивного образования, включая выявление уникальных особенностей обучения и потребностей глухих или слабослышащих учащихся. Во-вторых, важно оценить опыт и влияние интеграции технологий распознавания жестового языка в образовательный процесс, чтобы понять, как эти технологии влияют на образовательные достижения людей с нарушениями слуха. В этом контексте проводится тщательное рассмотрение современных технологических достижений, что позволит глубже понять, как можно использовать инновационные решения для улучшения инклюзивного образования. На основе полученных результатов можно предложить рекомендации для дальнейших исследований, направленных на развитие и внедрение таких технологий в образовательные учреждения, что в свою очередь будет способствовать созданию более инклюзивной

образовательной среды и улучшению результатов обучения учащихся с различными потребностями.

**Ключевые слова:** инклюзивное образование, глухие, язык жестов, система распознавания, образование равных возможностей, инклюзивное обучение, специальные образовательные потребности, внедрение технологий в образование

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