university of groningen / faculty of behavioural and social sciences

Educational Technologies for Girls with Disabilities in European Union Countries: A Systematic Review

Afra Isik

S5911281

Master's program Youth 0-21, Society and Policy

Faculty of Behavioural and Social Sciences

University of Groningen

Supervisor: Prof. dr. Alexander Minnaert

Second assessor: Dr. Run Tan

May 2025

Word count: 8221

Abstract

English

This thesis presents a systematic literature review exploring the role of educational technologies (EdTech) in improving the learning outcomes of girls with disabilities and promoting social inclusion in European Union (EU) countries. Despite growing global advocacy efforts for inclusive education, girls with disabilities continue to be among the most marginalized groups facing intersecting barriers related to gender and disability. This review examines studies published between 2014 and 2024 that focus on EdTech interventions. The findings stemming from the four included studies highlight various technological tools, such as humanoid robots, ICT applications, and assistive devices, that support the development of communication, autonomy, and academic performance. While these interventions are promising, the findings also highlight challenges such as the limited availability of gender-disaggregated data, small sample sizes, the lack of long-term studies, and the need for gender-sensitive, culturally sensitive, and user-centered design approaches. This study aims to contribute to academic discussions on inclusive education and provide practical insights for policymakers, researchers, and practitioners seeking to improve EdTech applications for girls with disabilities.

Dutch

Deze scriptie presenteert een systematisch literatuuronderzoek naar de rol van onderwijstechnologieën (EdTech) bij het verbeteren van de leerresultaten van meisjes met een handicap en het bevorderen van sociale inclusie in landen van de Europese Unie (EU). Ondanks de toenemende wereldwijde inspanningen voor inclusief onderwijs behoren meisjes met een handicap nog steeds tot de meest gemarginaliseerde groepen die te maken hebben met elkaar overlappende belemmeringen op het gebied van gender en handicap. Dit overzicht onderzoekt studies die tussen 2014 en 2024 zijn gepubliceerd en die zich richten op EdTech-interventies. De bevindingen gebaseerd op de vier geselecteerde studies wijzen op verschillende technologische hulpmiddelen, zoals humanoïde robots, ICT-toepassingen en ondersteunende apparaten, die de ontwikkeling van communicatie, autonomie en schoolprestaties ondersteunen. Hoewel deze interventies veelbelovend zijn, wijzen de bevindingen ook op uitdagingen, zoals de beperkte beschikbaarheid van naar geslacht uitgesplitste gegevens, kleine steekproeven, het gebrek aan langetermijnstudies en de behoefte aan genderbewuste, cultuurgevoelige en gebruikersgerichte ontwerpbenaderingen. Deze studie wil een bijdrage leveren aan de academische discussie over inclusief onderwijs en praktische inzichten bieden aan beleidsmakers, onderzoekers en praktijkmensen die EdTech-toepassingen voor meisjes met een handicap willen verbeteren.

Contents

1. INTRODUCTION 4
1.1 Background 4
1.2 Literature Review 6
1.3 Academic and Social Relevance 7
1.4 Overview of Research Questions and Structure 8
2. METHODOLOGY 9
2.1 Inclusion and Exclusion Criteria 9
2.2 Search Strategy 10
2.3 Data extraction and analysis 12
3. RESULTS 14
3.1 Thematic Presentation of Findings 17
3.1.1 Theme I. EdTech Typologies for Girls with Disibilities 17
3.1.2 Theme II. Impact on Learning Outcomes and Inclusion 17
3.1.3 Theme III. Barriers and Enablers to Implementation 19
3.2 Risk of Bias 20
4. DISCUSSION 21
4.1 General Interpretation of the Findings 21
4.2 Conclusion 23
4.2 Strengths and Limitations 24
4.3 Implications 24
4.3.1 Research 24
4.3.2 Policy 24
4.3.3 Practice 25
References 27
Appendix A 35
Appendix B 36

1. INTRODUCTION

1.1 Background

Every child has the right to learn, develop and grow in an environment where their needs and abilities are valued and respected (Inclusion Europe, 2025). The provision of inclusive and equitable quality education and lifelong learning opportunities for all is a key theme of the United Nations' 2030 Sustainable Development Goals (2015). However, inequalities in educational opportunities for women and girls with disabilities are influenced by systemic oppressions (UNFPA, 2018). UNICEF's 2022-2025 Gender Action Plan (GAP) places special emphasis on girls with disabilities and acknowledges that girls with disabilities face additional barriers and are at higher risk of being excluded from education and social participation due to the intersection of gender, disability, poverty, race and migration (UNICEF, 2021). For example, girls with disabilities are much less likely to attend primary school and finish secondary school compared to boys with disabilities (Leonard Cheshire, 2021). Girls with autism, cerebral palsy, hearing and vision impairments, learning disabilities and/or multiple disabilities are considered one of the world's most marginalized and underrepresented groups in research (UNGEI, 2017).

Historically, assistive technologies (AT), such as eyeglasses, Braille, and the first wheelchairs, were developed to improve specific functional abilities of people with disabilities and laid the foundation for the field (Donmez, 2024). Over time, these tools have evolved from being specialized solutions addressing only specific user groups to more inclusive and often mainstream technologies (Zallio & Ohashi, 2022). In the educational context, digital learning tools such as screen readers, text-to-speech software and adaptive input devices developed for students with visual, auditory, cognitive and/or physical disabilities are increasingly being integrated into a wider range of classroom environments (Edyburn, 2020). A systematic literature review examining the evolution of assistive technologies (Zallio & Ohashi, 2022) shows that this development has evolved from a deficit-only model to a more inclusive design approach. This evolution suggests that assistive technologies not only provide equitable learning opportunities, but also foster innovation in general educational technologies. The study argues that as digital learning tools continue to evolve, the boundaries between assistive technology and general education tools are increasingly blurred, which highlights the importance of designing universally accessible learning environments.

This natural transition towards inclusivity is consistent with the principles of Universal Design for Learning (UDL), which encourages the development of flexible learning environments that meet

the diverse needs of all learners from the outset. UDL is based on the belief that differences among learners are the norm rather than the exception, and therefore advocates that learning environments should be proactively designed to provide multiple means of participation, representation, and expression (CAST, 2024). By adopting UDL principles, educators and designers can create learning tools that are accessible to a wider audience rather than adding assistive technologies as an afterthought. This approach not only benefits students with disabilities but also supports a wide range of learning preferences, cultural backgrounds, and cognitive styles (CAST, 2024). As noted by Zallio and Ohashi (2022), the convergence of assistive and general education technologies further reinforces the need for universal design frameworks like UDL to ensure that all students can meaningfully participate in digital learning environments.

However, while technology alone is not a magic tool that can solve everything, it can play a supportive role in inclusive educational approaches that are appropriate for all types of learners (Allier-Gagneur & Moss Coflan, 2020; Jordan & Myers, 2022; UKaid, 2023). While advances in educational technologies (EdTech) offer great potential to overcome barriers to inclusion (Salas-Pilco et al., 2022), digital tools such as adaptive learning platforms, assistive technologies and virtual classrooms can play a transformative role in making education more accessible and inclusive (Mihovska et al., 2021) These tools can meet diverse learning needs and break down barriers by enabling students with disabilities to actively engage with educational content (Rizk & Hillier, 2022). For example, text-to-speech conversion software, real-time subtitles and customizable interfaces increase the engagement of students with different disabilities in their learning (Singal et al., 2021). The EU Disability Rights Strategy 2021-2030, announced by the European Commission in March 2021, is designed as a 10-year roadmap to promote the rights of people with disabilities (EU, 2021). The strategy includes detailed objectives and actions such as facilitating access to information and procedures, ensuring that digital platforms comply with accessibility standards, supporting vulnerable groups such as women and children with disabilities and combating discrimination. The strategy sets clear objectives, such as ensuring that digital platforms comply with accessibility standards to facilitate access to education and employment, and supporting vulnerable groups such as girls with disabilities (EU, 2021). The strategy is in line with the principles set out in the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), which emphasizes the right to education for all, regardless of disability (UN, 2006) and principles such as the 1994 Salamanca Declaration, which emphasizes the necessity to establish inclusive education as a government policy (UNESCO, 1994). While the EU has demonstrated its commitment to inclusive digital tools through the European Accessibility Act (2019) , which aims to ensure that digital services and products are

accessible to people with disabilities, and the Digital Education Action Plan (2020), which promotes the development and adoption of inclusive digital tools in education systems, in addition to the Disability Rights Strategy, the extent to which countries are able to fulfill their promise of quality education for all children with disabilities without discrimination remains an important question (Waisath et al., 2022).

1.2 Literature Review

The literature review by Navarro-Ibarra et al. (2023) shows that ICT research generally focuses on general education and technology issues. However, there are limited studies in areas such as autism, rural areas, inclusive education, disability, cyberbullying, indigenous issues, social exclusion and Down syndrome (Navarro-Ibarra et al., 2023). On the other hand, it is thought that information and communication technologies (ICT) are becoming increasingly important for people with disabilities and digital inclusion can be a social mechanism against the social exclusion of disability (Lin et al., 2018); such technologies enable people with disabilities to identify their own abilities and play a more active role in their communities (Adkins et al., 2013). Noteworthy is that the potential of ICT studies to marginalize individuals with disabilities (Ellcessor, 2017) is also found in literature.

Educational Technology (EdTech) literature for students with disabilities has expanded considerably in recent years. Research in this field covers a variety of technological tools and approaches that aim to improve learning outcomes (Annus & Kmet, 2024; Kasim & Deringol, 2024; Rizos et al., 2024) and promote social inclusion for people with disabilities (Eysink et al., 2020; Kewalramani et al., 2024; Marín et al., 2025; Rizk & Hillier, 2022; Sorensen & Andersen, 2017). In a recently published large-scale systematic review (Navas-Bonilla et al., 2025) it was found that various educational technologies facilitate personalized and equitable learning by removing barriers for students with disabilities; promote the development of critical skills; and support collaboration among students, enriching both their academic education and social integration. Although the study does not provide a direct gender-specific result, it suggests that age, gender, health status, race, traditions, nationality and other factors that differentiate individuals from each other play an important role in processes of exclusion or unequal treatment in the field of education and are variables that need to be taken into account in true inclusive education. Systematic reviews of low- and middle-income countries are common in the literature. While one study found that access to technology empowers girls more than boys and that girls are the group that can benefit the most from inclusive EdTech interventions (Webb et al., 2020); another study suggests that technology-based interventions can play

an important role in reducing gender differences caused by traditional teaching methods (Pitchford et al., 2019). A study on the learning outcomes of female students focusing on the educational technologies used showed that software-oriented interventions had a more positive impact than hardware-oriented ones (Jordan & Myers, 2022).

Despite the growing literature on EdTech for students with disabilities and girls (UKaid, 2023), research specifically addressing the needs of girls with disabilities is sparse. For example, a recent meta-analysis of the effects of interventions involving tablet-based speech generating devices on individuals with autism spectrum disorders suggests that future research should consider gender distribution and analyze the impact of this variable on intervention outcomes to better understand the role of gender in the effectiveness of tablet-based speech generating devices (Muharib et al., 2024). Studies involving girls with disabilities often lack sex-disaggregated data, making it difficult to assess the different needs and experiences of this group, and there is an urgent need for research that includes exploratory factors such as gender and geographical location (Lynch et al., 2024).

Hence, the need for this research stems from the critical importance of understanding how EdTech can improve the learning outcomes and social participation of girls with disabilities (Naneetha & Srihari, 2021). With the increasing use of EdTech in educational settings, there is a lack of understanding of how these technologies support the unique needs of girls with disabilities (Lynch et al., 2024). This thesis research aims to provide valuable insights to policymakers and educators by examining the types of EdTech interventions used, their outcomes in terms of academic and social development, and the barriers and opportunities that influence their implementation.

1.3 Academic and Social Relevance

This thesis research aims to contribute to academic discourse by addressing an important knowledge gap at the intersection of educational technology (EdTech), disability studies and gender. While there is considerable research on the general applications of EdTech for students with disabilities, there has been limited interest in examining how such technologies impact learning outcomes and social inclusion for girls with disabilities (Naneetha & Srihari, 2021). Given the EU's leadership on inclusive policy development and its emphasis on the digital transformation of education (EU, 2019, 2020, 2021), it is both timely and critical to examine how educational technologies address the needs of girls with disabilities. By focusing on gender-specific barriers and enablers specific to EU countries, this study can contribute to understanding how EdTech can be used to support girls with disabilities in schools, encouraging policy makers, educators and technology developers to design

more inclusive learning environments. The potential impact of this research extends to the underpinning, development and implementation of tailored interventions that address the unique needs of girls with disabilities and promote their rights to quality education, personal empowerment and social inclusion. Furthermore, this study can pave the way to the formulation of future policies and initiatives aimed at eliminating gender-specific inequalities in access to EdTech resources.

1.4 Overview of Research Questions and Structure

Aim: To explore the role of educational technologies in improving learning outcomes and inclusion for girls with disabilities in EU countries by means of a systematic literature review.

Research Questions:

- **RQ1:** What types of EdTech interventions are being used to support girls with disabilities in EU countries?
- **RQ2:** What are the key outcomes of these interventions in terms of learning and social inclusion?
- **RQ3:** What barriers and enablers influence the implementation of EdTech for girls with disabilities in EU countries?

This thesis started with **an introductory chapter** presenting the background and rationale for the study. Then, the existing literature on students with disabilities was critically reviewed. Key models and theories as well as empirical findings on the effectiveness of EdTech in promoting learning and basic inclusion are discussed and gaps are identified. Next, the problem statement and research questions were presented, including the overall structure of the thesis. Chapter 2, **methodology,** details the systematic literature review process used in the study. The inclusion and exclusion criteria, information sources, data extraction methods and risk of bias assessment are explained. The findings section presents the findings of the systematic literature review. **The results** are categorized according to the research questions, highlighting the types of EdTech interventions used, their outcomes, and barriers and facilitators to implementation. **The discussion section** aims to provide a critical evaluation of the findings in relation to the existing literature and theoretical framework. It reflects on implications for policy, practice and future research in the context of the intersection of gender, disability and educational technology. The final section, **the conclusion**, summarizes the research findings, discusses the limitations of the study and offers recommendations for future research.

Furthermore, the academic and societal significance of the study is emphasized, especially in terms of informing evidence-based policies and improving educational practices for girls with disabilities.

2. METHODOLOGY

This study conducts a systematic review to analyze educational technologies (EdTech) used to support the education of girls with disabilities in European Union (EU) countries. A systematic review provides a structured approach to collect and synthesize previous research, helping to identify research gaps, areas of uncertainty and opportunities for further study (Petticrew & Roberts, 2006). This review aims to summarize existing knowledge and provide insights into how EdTech contributes to inclusive education for girls with disabilities. To ensure a rigorous and transparent methodology, this review was prepared in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021) and the principles outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2021; Moher et al., 2009). The PRISMA protocol was preferred because it offers a structured process for literature searches, study selection and data extraction. The PRISMA checklists and flowchart are intended to increase clarity and transparency in the presentation of findings (Munn et al., 2018).

2.1 Inclusion and Exclusion Criteria

Table 1

Inclusion and Exclusion Framework

Inclusion criteria	Exclusion criteria
Studies focusing on girls with disabilities attending primary, secondary, and upper secondary schools in EU countries.	Studies that focus on school levels other than primary, middle, and high school. Studies conducted outside the EU.
Learning and social inclusion related to the use of EdTech to support the education of children with disabilities	Studies with results unrelated to EdTech.
A wide range of empirical study designs, including randomized controlled trials (RCTs), quasi-experimental designs, case studies, and surveys.	Studies conducted outside the EU. Studies that did not comprise new empirical data.
Peer-reviewed journal articles published entirely in English.	Articles that are not in English and not published in peer-reviewed journals.

Studies published between 2014 and 2024 to reflect recent developments in EdTech and inclusive education.	Studies published before 2014 or after 2024.

Strict inclusion and exclusion criteria were applied to ensure the relevance and quality of included studies. One of the inclusion criteria was that the study was conducted in EU countries. As of March 2025, there are 27 member states in the European Union. These are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden (EU, 2025).

This review focuses on girls with disabilities attending primary, secondary or upper secondary schools. The study examines how EdTech supports learning and social inclusion for girls with disabilities. A variety of empirical research designs are included, including Randomized Controlled Trials (RCTs), quasi-experimental designs, case studies and surveys. No particular research design is prioritized to ensure a broad and comprehensive analysis. Only peer-reviewed journal articles published entirely in English were included and only studies published between 2014 and 2024 were considered to reflect current developments in EdTech and inclusive education.

Studies were excluded if they focused on a school level other than primary, middle and high school and EdTech was not considered as an intervention. We also excluded studies conducted outside of EU countries that did not provide gender-specific data, i.e. studies that did not distinguish between boys and girls in their analysis and did not include girls.

2.2. Search Strategy

In order to provide a comprehensive coverage of relevant studies, a comprehensive literature review was conducted in three major academic databases: i.e., Web of Science, Scopus and ERIC. These databases were chosen for their high academic credibility and broad coverage of peer-reviewed research. Web of Science is a multidisciplinary citation database that provides high-quality, peer-reviewed literature in various research areas (Schnell, 2017). Scopus is the largest abstract and citation database of peer-reviewed journal articles and provides a comprehensive search of relevant

publications (Schotten, 2017). ERIC (Educational Resources Information Center) is a database specific to educational research run by the US Department of Education.

To identify relevant studies, keywords related to disability, educational technology, target audience, and school type were combined using Boolean search operators. This ensured that studies covering assistive technologies and inclusive education were included in the search results. The list of terms used in the search is provided in Appendix A

The first search was conducted on April 1, 2025 and the last search was conducted on April 4, 2025. The reference management tool Zotero was used to manage and organize the collected studies. Zotero provided an efficient screening process by helping to store, organize and remove duplicate studies.

The screening process was conducted in two stages:

Title and Abstract Screening. Studies were first screened according to their titles and abstracts to eliminate irrelevant studies. The identification of the articles and the screening process at this stage was carried out only by the main researcher; no second researcher was involved.

Full Text Review. At this stage, the remaining studies were thoroughly analyzed to determine whether they met the inclusion criteria.

The original search string:

(disability OR disabled OR impairment OR impaired OR special OR "special needs" OR blind OR "low vision" OR "partially sighted" OR "visually impaired" OR deaf OR "hard of hearing" OR "hearing impairment" OR "deaf-blind" OR "multi-sensory impairment" OR "intellectual impairment" OR "intellectual disability" OR "learning dis*" OR "slow learners" OR "mental retardation" OR "autism spectrum disorder" OR asd OR "PDD-NOS" OR "children with communicative multiple disabilities" OR cmb OR "asperger syndrome" OR "attention deficit hyperactivity disorder" OR adhd OR add OR "cerebral palsy" OR dyslexia OR dyspraxia OR "physical disability" OR "physical impairment" OR "physically challenged" OR "chronic diseases" OR asthma OR cancer OR "kidney problems" OR "heart problems" OR insulin OR diabetes) AND (technolog* OR "assistive devices" OR "assistive aids" OR "augmentative alternative communication" OR aac OR "universal design for learning" OR udl OR "one laptop per child" OR olpc OR "mobile handheld devices" OR smartphone* OR iphone* OR tablet* OR laptop* OR computer* OR tv OR radio* OR ict OR ai) AND ("primary school" OR "elementary school" OR "primary education" OR "elementary education" OR "secondary school" OR "middle school" OR "high school") AND (girl* OR female* OR woman OR women OR gender OR sex)

1.3 Data Extraction and Analysis

First, the search terms were entered into the ERIC database, and 786 results were obtained. After applying filters for date, publication type, language, and country, this number was reduced to 25. The results were transferred to an Excel file. Next, a search of the Scopus database returned 1,516 results; after applying the required filters, 149 results remained for analysis and were also transferred to an Excel file. Finally, a search of the Web of Science database returned 526 studies; after applying filters, this number was reduced to 81 studies, which were also transferred to Excel.

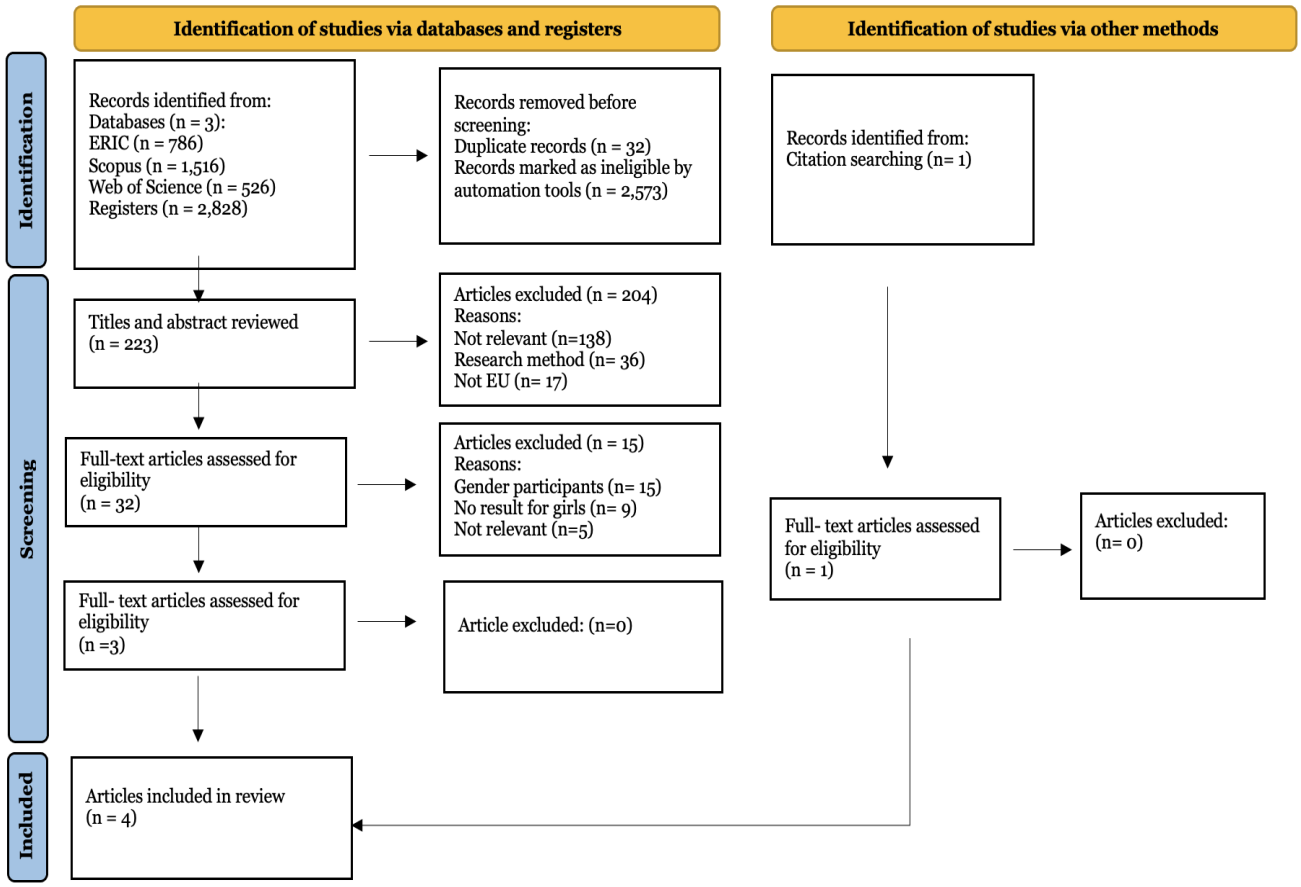
Of the 255 studies transferred to the Excel file, 32 were duplicates and were removed, leaving 223 original studies for review. After reading all the titles, 138 studies were excluded because they were not relevant to the research. 36 studies were not considered suitable due to their research methodology.

Although the filters included the criterion of being conducted in EU countries, 17 studies conducted in non-EU countries such as Switzerland, Ukraine, the United Kingdom, and Turkey were excluded. Some of these studies were conducted in EU countries, but they were excluded because the participants were from countries such as Hong Kong and Brazil.

Of the remaining 32 articles for full-text review, 15 did not specify gender or were conducted only with male students, 9 did not include results specific to girls, and 5 were deemed not directly relevant to the research topic. After a full-text review of another article found via snowballing and deemed suitable for inclusion in the study, a total of 4 studies were found to be suitable for analysis. These remaining 4 articles were analysed according to the criteria developed by Hawker and colleagues (2002) for quality assessment. Details of this quality assessment are presented in Appendix B. The PRISMA flow diagram for the inclusion process is presented below (Figure 1).

Figure 1

PRISMA Flow chart of the included articles



3. RESULTS

The findings section will begin with a general summary of the four studies. Table 2 will provide information on the location of the study, sample sizes, and sample ages. After presenting the methodology of the study and the definition of the intervention, the main findings of the study related to the current research will be presented. After presenting the findings in detail under three separate themes, the possible biases of the studies will be discussed.

Table 2

Overview of the studies included in the analysis (n=4)

Study	Country	Sample		Method	Intervention Description	Key findings relevant to the present study
		Size	Age			
Gkiolnta et al., 2023	Greece	2	8	Observation- case study	Robot programming sessions using Codey Rocky were designed to enhance the social and communication skills of an 8-year-old girl with ASD	- The girl with ASD showed an improvement in her social and communication skills. - There was also a marked reduction in her challenging behaviors, although some repetitive and stereotyped behaviors persisted during the sessions.
Desideri et al., 2020	Italy	1	6	Observation- case study	The *RoBò* service delivery model supports teachers in using a humanoid robot to promote social interaction and inclusion of children with ASD in mainstream classrooms.	- The use of the humanoid robot acted as a social mediator, encouraging interaction between the child with ASD (Alice) and her peers, thus promoting inclusion in mainstream classes. - The robot contributed to the development of basic social skills of the child with ASD by helping to teach social cues, turn-taking and appropriate responses in social situations.

Andreou et al., 2016	Greece	Total 66 students Group A (using ICT): 32 students (23 boys, 9 girls) Group B (tradition al method): 34 students (24 boys, 10 girls)	13-14	comparative case study	Students with ADHD were divided into two groups: one used computer-based tools and the other used traditional paper-and-pencil methods to write essays.	-The study found that while ICT use improved writing performance for boys with ADHD, it had little effect on girls. - Girls' scores were similar with or without ICTs, suggesting limited impact. This may be due to lower confidence, less frequent use, and less positive attitudes toward technology among girls. - The findings highlight the need for gender-sensitive, inclusive strategies to ensure ICT benefits all students equally.
Stasolla et al., 2014	Italy	3	9-12	multiple single-subject experimental design	The study used assistive technologies to help three girls with Rett syndrome make independent choices and reduce stereotypic behaviors (like rocking, hand washing, and mouthing).	- Improving adaptive behaviors and supporting choice making. - Reducing stereotypic behaviors like hand mouthing and rocking. - Enhancing participation in decision-making.

After presenting the four studies in chronological order, from the most recent to the oldest, the categories of country, sample, method, field of study, and key findings related to the current study were added to Table 1. Of the four studies included, two were conducted in Italy and two in Greece. Looking at the study population, one of the studies in Italy was conducted with one autistic girl, and the other with three girls with Rett syndrome. Rett syndrome is a pervasive developmental disorder linked to mutations on the X chromosome, primarily affecting brain development (Amir et al., 1999). It is a genetic disorder that typically becomes apparent between 6 and 18 months of age and occurs almost exclusively in females (Neul et al., 2010). Clinical symptoms include impairments in language and coordination, repetitive hand movements, slowed growth, gait abnormalities, and microcephaly, or reduced head growth (Percy et al., 2007; Hagberg, 2002).

One of the studies in Greece was conducted with an autistic girl and a typically developing boy, while the other included a comparison of students with and without ADHD. The sample age range varies between 6 and 12. Two of the four studies used an observational case study design, one used a semi-experimental comparative case study design, and one used a single-subject experimental

design. The study using the semi-experimental comparative case study design examined the effect of ICT use on the writing performance of students with ADHD. Two groups were formed — one using ICT tools (e.g., concept mapping software, interactive whiteboards) and the other using traditional pen and paper methods — and used as comparative cases. To ensure comparability between groups, participants were matched on key background variables such as age (13–14), academic performance (11th–12th grade), computer literacy, and socioeconomic factors (assessed via questionnaires). Both groups completed the same descriptive writing tasks and were evaluated using the same analytical rubric. Group-level performance was statistically compared using t-tests and factorial ANOVA to assess the effects of teaching method and gender, and case comparisons were made at the level of teaching and performance outcomes.

In the study by Gkiolnta et al. (2023), a ready-to-use robot called ‘Codey Rocky’ designed to teach coding and programming to primary school children was used. The educational activities were designed to facilitate a three-way interaction between two eight-year-old schoolchildren attending the same class at a primary school in Northern Greece and the robot. The children participated in structured sessions involving the robot, aimed at promoting interaction, communication, and social participation. The researchers observed and recorded changes in the girl's social and communication behaviors, as well as any changes in challenging behaviors, throughout the intervention. An 8-year-old girl with Autism Spectrum Disorder (ASD) who participated in robot programming activities showed an increase in social and communication skills. There was a decrease in problematic behaviors. Robot-assisted education has supported inclusivity by increasing the active participation and social interaction of children with autism in the learning process. It has been emphasized that tailored approaches and the appropriate adaptation of technology offer a great opportunity for children with different developmental needs.

Desideri and colleagues' study (2020) presents the RoBò approach, a multidisciplinary service designed to assist teachers in using humanoid robots to promote the inclusion of children with ASD in mainstream educational settings. After providing an overview of these models, the study details a four-phase process aimed at integrating social robots into classroom activities to support children with ASD. The authors examine the case of Alice, a six-year-old girl with ASD and no other intellectual disabilities, as their sample. This case study demonstrates how the humanoid robot framework (RoBò) can be applied in a real-world classroom scenario. The RoBò service model has shown that robot-assisted activities can increase social interaction opportunities for children with autism. Specifically, in the case study (6-year-old Alice), working with the robot enhanced the student's social participation

and communication initiatives within the classroom. The use of humanoid robots (especially the NAO robot) has contributed to the inclusion of children with autism in a more inclusive educational environment with their peers. In addition, teachers have been supported to increase inclusivity through robot-assisted activities tailored to individual needs.

In a study by Andreou and et al. (2016), students with ADHD who used Information and Communication Technologies (ICT) wrote more successful essays than those who used pen and paper. In particular, male students showed significantly better performance when using ICT, while no effect of ICT use on performance was observed in female students. Technology use has enabled male students with ADHD to participate more effectively in the learning process. However, since no similar benefit was observed for female students, it has been emphasized that gender-sensitive, differentiated technology-supported methods need to be developed to ensure full inclusivity.

In the study by Stasolla and et al. (2014), convincing evidence is presented that educational technologies can significantly improve the quality of life, learning participation, and social participation of girls with serious disabilities such as Rett syndrome. In three girls with Rett syndrome, supportive technologies (photocells, interfaces, and computer use) improved their decision-making skills. Additionally, stereotypical behaviors (e.g., rocking, hand-washing movements) decreased during the intervention. During the intervention period, the children's happiness indicators also improved. Assistive technologies have created an inclusive learning environment by enabling children with severe and profound developmental disabilities to make more independent choices. Such support has both improved quality of life and strengthened individual participation.

3.1 Thematic Presentation of Findings

3.1.1 Theme I. EdTech Typologies for Girls with Disabilities

The studies examined include interventions such as robot-assisted learning, customized learning applications, and computer-assisted tools. In particular, interactive robots (Gkiolnta et al., 2023; Desideri et al., 2020) have been used to improve communication skills and facilitate social interaction in students with autism, providing insights into potential scalable applications for girls with cognitive or communication disabilities. Both studies emphasize the potential of humanoid robots as educational technologies that support the learning and social development of children with ASD.

Andreou et al. (2016) investigated the effect of ICT on the writing performance of students with Attention Deficit Hyperactivity Disorder (ADHD). Students were taught the same material, but one group used computers while the other group used traditional paper-and-pencil methods. The study found that ICT tools, such as word processors and educational software, improved writing skills, particularly among boys with ADHD. Stasolla et al. (2014) focused on three girls with Rett syndrome who used technological aids to support decision-making strategies. The stimuli included music, cartoons, and colored lights selected according to each girl's preferences. The technology was structured to respond to the girls' object placement behaviors, giving them control over their environment and enabling them to engage in choice-making activities.

3.1.2 Theme II. Impact on Learning Outcomes and Inclusion

Enhanced Participation and Communication. Gkiolnta and colleagues' study (2023) focused on an eight-year-old girl (Alice) with OSB and moderate intellectual disabilities. She participated in structured educational activities using “Codey Rocky,” a programmable robot designed for elementary school children. The intervention aimed to enhance social and communication skills through tasks typically involving collaboration with a developing peer. One of the intervention outcomes was an increase in the girl's joint attention and social interaction during the sessions. For example, examples of joint attention increased from 5 in the first session to 10 in the last session, peaking at 14 in the seventh session. In addition, there was a significant improvement in communication skills, including eye contact and emotional expression, with the frequency of eye contact doubling from before the intervention to after the intervention. A decrease in challenging behaviors such as aggression and anger outbursts was also observed in Alice during the intervention period. Desideri et al. (2020) introduced the RoBe service delivery approach, which uses humanoid robots to facilitate the inclusion of children with ASD in mainstream classrooms. The approach focuses on improving social participation and communication skills through robot-mediated interactions. One of the main findings of the study was that the use of humanoid robots acted as a social mediator by encouraging interaction between children with ASD and their peers, thereby promoting inclusion in mainstream classrooms. Additionally, robots have contributed to the development of basic social skills among children with ASD by assisting in teaching social cues, turn-taking, and appropriate responses in social situations.

Improved Academic Performance. Andreou et al. (2016) found that the use of ICT improved writing performance in students with ADHD compared to a paper-and-pencil group. However, gender differences emerged: Boys benefited more from ICT use than girls in terms of writing performance.

For girls, no significant difference was found in writing outcomes between ICT-using and non-using groups, suggesting that technology can enhance learning, but its impact may vary depending on gender and individual needs.

Increased Autonomy and Inclusion. Stasolla et al. (2014) demonstrated that technological aids enabled girls with Rett syndrome to make choices and express their preferences, leading to greater autonomy and inclusion in educational settings. In Stasolla et al.'s multiple single-case design study (2014), each girl showed a significant increase in placing objects into containers to activate preferred stimuli, indicating learning and behavioral gains. There was a significant decrease in repetitive, non-purposeful movements (e.g., hand-to-mouth, body rocking), indicating improved self-regulation and reduced need for self-stimulation. Happiness indices increased significantly, showing greater enjoyment and emotional sensitivity during sessions. The ability to choose between different stimuli encouraged a sense of agency, which is critical for participation. Girls with Rett syndrome spent more time on meaningful and purposeful activities, which are key components of educational achievement and social participation. In contrast to girls with Rett syndrome, an autistic girl (Gkiolnta et al., 2023) exhibited repetitive behaviors more frequently in the initial sessions, showing a decreasing trend toward the final sessions.

3.1.3 Theme III. Barriers and Enablers to Implementation

The use of programmable robots has facilitated structured interactions between children with ASD and typically developing peers, thereby promoting social participation and communication skills; thus, they have served as social mediators and encouraged inclusion in general classrooms (Gkiolnta et al., 2023; Desideri et al., 2020). The robot's consistent and predictable responses provided a comfortable and controlled environment for the child, enhancing learning and interaction (Gkiolnta et al., 2023). The tools used were accessible and technologically uncomplicated, facilitating use and replication in home and school settings, as well as increasing motivation and participation through the adaptation of content to individual preferences (Desideri et al., 2020; Stasolla et al., 2014). Parents and educators were understanding and supportive, recognizing the value of assistive technologies (AT) in their children's development (Stasolla et al., 2014), and the co-design of interventions with local stakeholders increased sustainability and acceptance (Gkiolnta et al., 2023).

Effective implementation requires sufficient resources and training for educators to integrate humanoid robots into the classroom environment, which can pose challenges in resource-limited settings (Desideri et al., 2020). Additionally, while technology is relatively inexpensive, sustainable implementation requires trained personnel, consistent routines, and technical support (Andreou et al., 2016). The special support needs of students with disabilities, which may limit scalability and broader application, have been highlighted in many studies (Gkiolnta et al., 2023; Andreou et al., 2016; Stasolla et al., 2014). Access to ICT tools has been found to increase learning participation and performance for males (Andreou et al., 2016). However, gender differences in attitudes toward technology and technology use have been identified, and it has been discussed that girls may not be able to benefit from ICT to the same extent without tailored support, and that there may be a lack of specialized ICT interventions that take into account girls' specific learning styles and needs (Andreou et al., 2016). In Stasolla et al.'s study (2014), participants had profound developmental and mental disabilities that required careful design and ongoing support to facilitate use. Girls started with minimal interaction or participation, which required a gradual, supportive intervention to build capacity. Barriers such as limited teacher training, lack of localized content, and infrastructure constraints were present in the studies (Gkiolnta et al., 2023; Stasolla et al., 2014), and some tools were found to be “technologically complex and intimidating” by unfamiliar educators (Desideri et al., 2020).

3.2 Risk of Bias

None of the studies presented randomly selected participants. Desideri et al. (2020) presented a single participant (Alice) selected by the school. Gkiolnta et al. (2023) included only one ASD child and one typically developing peer, while Stasolla et al. (2014) included three female students with Rett syndrome. In Andreou and colleagues' study, 66 students were divided into two groups. These are generally very small and non-random samples, posing a high risk of bias as they cannot be generalized to other populations.

Additionally, Andreou et al. (2016) did not implement true randomization. Students were divided into two groups (ICT and non-ICT), but this distribution was not based on random assignment; rather, it appeared to be semi-random or convenience-based. Although the authors aimed to represent a sample of students with ADHD, the total sample size was small (66 students) and all

participants came from a single geographic region (Drama, Greece). This limits generalizability. This limited geographical diversity is also a source of bias that could affect generalizability.

With the exception of Stasolla et al. (2014), none of the other studies allowed for or implemented blinding of participants, observers, and/or researchers. Desideri et al. (2020) study was terminated early due to the COVID-19 pandemic; the planned 12-week intervention period was reduced to only 2 weeks, therefore hampering the fidelity and the strength of implementation. In Gkiolnta et al. (2023) study, the behaviors of typically developing (TD) children were not quantitatively assessed. Therefore, it may not be possible to distinguish whether the effects observed are due to the robot or the child's interaction. Additionally, since the study design did not include a comparison group or alternative conditions, the observed improvements cannot be attributed solely to the intervention. Finally, the study by Andreou et al. (2016) included a large number of male participants (group A: 23 males, 9 females; group B: 24 males, 10 females). Although the authors attributed this gender distribution to the higher prevalence of ADHD in males compared to females, gender was one of the main variables in this study and should therefore be considered a potential confounding factor.

4. DISCUSSION

4.1 General Interpretation of the Findings

The four studies examined in this paper present the promising effects of technological interventions developed to contribute to the educational and social development of children with special educational needs. The studies cover the use of information and robot technologies, particularly in the context of special needs such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and Rett syndrome.

Andreou et al. (2016) focused on how information and communication technologies (ICT) affect the writing performance of students with ADHD. Gender emerged as an important variable in this study, highlighting the differing needs of female and male students. In this context, the necessity of individualized and gender-sensitive technological approaches becomes apparent. Indeed, taking into account the needs of girls with disabilities in the design of digital tools and platforms ensures that these technologies are accessible and usable for them (UNICEF, 2020). Educational materials and methods should be designed in accordance with universal design principles to be accessible to all

students with different learning needs, thereby ensuring the effective participation of students with disabilities in the education process (Kefallinou et al., 2020; Navas-Bonilla et al., 2025).

When technology is appropriately matched, it not only helps students achieve academic success but also develops important life skills such as social participation and autonomy (Martinez & Scherer, 2018). Stasolla et al. study (2014), which examined the impact of technological tools developed to support decision-making skills in children with Rett syndrome, demonstrated how critical technological aids can be for individuals with severe communication limitations in participating in daily life. This finding is consistent with the results of Desideri and colleagues' (2020) study. Desideri's research emphasized that humanoid robots can increase social inclusion in classroom interactions. Robot-assisted interventions have contributed to the development of social skills by leading to significant increases in eye contact, joint attention, and positive social behavior in girls with autism. Additionally, humanoid robots have been shown to increase social interaction in the classroom, helping children with ASD communicate more effectively with their peers and participate in regular classrooms (Gkiolnta et al., 2023). Developing students' social skills and emotional intelligence contributes to the creation of a truly inclusive learning environment where each student's learning process is shaped according to their own pace and needs. This helps students discover their own learning paths and increase their self-awareness (Graham, 2024). However, the limited sample sizes restrict the generalizability of these findings.

Robots' consistent and predictable responses provide a safe and supportive learning environment for children, while the accessibility of tools and the availability of content that can be adapted to individual preferences have increased participation and motivation (Gkiolnta et al., 2023; Desideri et al., 2020). Indeed, the literature indicates that educational technologies increase students' interest in and participation in learning (Navas-Bonilla et al., 2025) and that active participation helps students take responsibility for their learning and develop self-regulation skills (Graham, 2024). Additionally, the support of families and teachers and collaboration with local stakeholders are among the factors that increase the sustainability of interventions.

Indeed, families and teachers are important stakeholders in the success of inclusive education. Their participation increases students' commitment to the educational process and provides support (Lynch et al., 2024). Improving the competence of teachers in special education enhances the quality of education and enables these teachers to work effectively with students with different needs (Kefallinou et al., 2020). However, findings indicate that teachers lack adequate training in integrating technology into the classroom and that some educators find technological tools complex or

intimidating (Desideri et al., 2020). A potential consequence is that teachers may not be able to implement and/or use technology effectively. Therefore, they need to participate in continuous professional development programs, particularly on teaching methods based on universal design principles and the effective use of EdTech tools (Lynch et al., 2024; Navas-Bonilla et al., 2025).

Additionally, lack of technical support, high special education needs of students with disabilities, infrastructure deficiencies, and absence of localized content are among the barriers to the large-scale implementation of applications. These findings are consistent with research results in the recent literature on educational technologies for inclusive education (Juma & Ntulo, 2024; Lynch et al., 2024; Navas-Bonilla et al., 2025).

4.2 Conclusion

This study highlights the significant potential of educational technologies (EdTech) in improving the learning outcomes, participation, communication skills, and autonomy of girls with disabilities. The findings emphasize that technologies such as social support robots, humanoid robots, information and communication technologies (ICT), and assistive technologies can be effective in meeting the specific needs of these children according to their individual circumstances.

However, this impact depends on several critical factors. First, the importance of personalized approaches, especially those sensitive to gender and specific learning profiles, is clear. Technologies should be developed in accordance with universal design principles to ensure accessibility for all learners. Second, the role of families, educators, and local stakeholders is critical to the sustainability and effectiveness of interventions. However, challenges such as limited training for teachers in educational technologies, infrastructure deficiencies, and a lack of culturally and linguistically appropriate content persist. Therefore, while educational technologies hold great promise, a systematic approach that fosters teacher’s pre- and in-service professional development, stakeholder collaboration, ongoing technical support, and the integration of inclusive design from the outset is necessary to realize their full potential. Future research should focus on long-term, large-scale studies to explore how inclusive technologies can be more effectively integrated into various educational needs.

4.3 Strengths and Limitations

One of the strongest aspects of this review is its systematic approach to synthesizing both gender-specific and disability-focused interventions, an area that is underrepresented in the existing literature (Lynch et al., 2024). Another strength is that the studies included in the analysis are limited to recent studies. This provides an up-to-date overview of a dynamic field such as educational technologies and aims to contribute to the body of knowledge on educational technologies used for girls with disabilities. The research focusing on girls with disabilities aims to highlight the combined challenges faced by this group and to emphasize gender-specific needs in the context of disability and inclusion.

However, potential researcher bias is among the limitations due to small sample sizes, lack of robust research designs, lack of long-term follow-up data, and the frequent involvement of the authors in both the intervention design and evaluation. In particular, generalizability across cultural or socioeconomic contexts is limited. Furthermore, only four studies were found to be suitable for this review. This limitation in disability-specific, gender-disaggregated data significantly narrows the scope of our research and makes it difficult to draw generalizable conclusions about European Union countries. Furthermore, due to the inclusion language criterion, relevant local studies published in languages other than English may not have been included.

4.4 Implications

4.4.1 Research

This review covers studies focusing on educational technologies used for girls with disabilities in the European Union. However, existing research has primarily focused on girls diagnosed with autism spectrum disorder, Rett syndrome, and attention deficit hyperactivity disorder (ADHD) and has addressed a limited number of EdTech approaches aimed at developing their social skills or decision-making strategies. Future research should examine the learning outcomes and social inclusion dimensions of girls with different types of disabilities in various educational technology contexts. No study has ensured the direct participation of students with disabilities in the design and evaluation processes of EdTech solutions. Additionally, small sample groups, short-term applications and

implementations, and the absence of control groups limit the generalizability of the results. It is important to collect qualitative data on the experiences of girls with disabilities who use EdTech and to investigate their participation in design and evaluation processes in order to research the long-term effects of EdTech on academic and social outcomes and to develop user-centered design.

Furthermore, the findings highlight the necessity of involving teachers and parents in the process for the successful implementation of EdTech solutions and emphasize some practical challenges such as infrastructure and cost. Future research should evaluate the roles and contributions of these stakeholders and focus on complementary elements such as teacher training and family participation, as well as investigate practical barriers such as technology adaptation, infrastructure deficiencies, and costs.

4.4.2 Policy

Studies evaluating the alignment of the Convention on the Rights of Persons with Disabilities (CRPD) and the Sustainable Development Goals (SDGs) with national laws indicate that, although EU countries generally adhere to these international commitments and have adopted laws supporting inclusive education, there are shortcomings and barriers in practice (Gunnars, 2024; Waisath et al., 2022). Findings indicate the need to finance continuous professional development programs for educators on assistive technologies and gender-sensitive teaching skills. In addition, the effectiveness of policies and practices should be monitored regularly and data should be collected and disaggregated by gender and disability status. To develop EdTech solutions collaboratively, policymakers, educators, technology developers, and organizations representing individuals with disabilities should cooperate, and schools should be provided with the necessary resources and support services to effectively implement inclusive education (Waisath et al., 2022).

4.5.3 Practice

In practical applications, practitioners should keep in mind that actively involving girls with disabilities in the design and development processes of digital solutions ensures a better understanding of their needs and expectations, thereby enabling EdTech solutions to effectively support their learning experiences. Considering the potential of educational technologies to provide content and methods tailored to students' individual learning needs (Navas-Bonilla et al., 2025), cooperative design processes between students, teachers, and developers should be sought to create more inclusive and engaging learning environments. In addition, parents and caregivers play an important role in the

access of girls with disabilities to digital technologies (Stasolla et al., 2014; UNICEF, 2020). Therefore, it is important that they are also informed and actively involved in the process. Educators should receive in-service training on inclusive teaching practices and the use of assistive technologies, and schools should adopt universal design principles and invest in teacher training to enhance the success of EdTech applications (Kefallinou et al., 2020).

REFERENCES

Adkins, B., Summerville, J., Knox, M., Brown, A. R., & Dillon, S. (2013). Digital technologies and musical participation for people with intellectual disabilities. *New Media & Society*, *15*(4), 501–518. https://doi.org/10.1177/1461444812457338

Allier-Gagneur, Z., & Moss Coflan, C. (2020). *Your Questions Answered: Using Technology to Support Gender Equity, Social Inclusion and Out-Of-School Learning*. EdTech Hub. https://doi.org/10.53832/edtechhub.0025

Amir, R. E., Van den Veyver, I. B., Wan, M., Tran, C. Q., Francke, U., & Zoghbi, H. Y. (1999). Rett syndrome is caused by mutations in X-linked MECP2, encoding methyl-CpG-binding protein 2. *Nature Genetics*, *23*(2), 185–188. https://doi.org/10.1038/13810

Andreou, G., Riga, A., & Papayiannis, N. (2016). Information and Communication Technologies and the Impact of Gender on the Writing Performance of Students with ADHD. *Themes in Science and Technology Education*, *9*(1), 25–41.

Annuš, N., & Kmeť, T. (2024). Learn with M.E.—Let Us Boost Personalized Learning in K-12 Math Education! *Education Sciences*, *14*(7), Article 7. https://doi.org/10.3390/educsci14070773

CAST. (2024). *The UDL Guidelines*. https://udlguidelines.cast.org

Desideri, L., Cesario, L., Gherardini, A., Fiordelmondo, V., Morganti, A., Malavasi, M., & Hoogerwerf, E.-J. (2020). Using a humanoid robot to promote inclusion of children with Autism Spectrum Disorders in mainstream classrooms: An overview of the RoBò service delivery approach. *Life Span and Disability*, 23(1), 41–51.

Donmez, M. (2024). Educational technology for physically disabled people: A systematic literature review. *Kocaeli Üniversitesi Eğitim Dergisi*, *7*(2), 581–606. https://doi.org/10.33400/kuje.1506082

Edyburn, D. L. (2020). *Rapid literature review on assistive technology in education*. Department for Education.

Ellcessor, E. (2017). Cyborg hoaxes: Disability, deception, and critical studies of digital media. *New Media & Society*, *19*(11), 1761–1777. https://doi.org/10.1177/1461444816642754

EU. (2019). *European accessibility act—European Commission*. https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/disability/union-equality-strategy-rights-persons-disabilities-2021-2030/european-accessibility-act_en

EU. (2020). *Digital Education Action Plan (2021-2027)—European Education Area*. https://education.ec.europa.eu/focus-topics/digital-education/action-plan

EU. (2021). *Union of equality: Strategy for the rights of persons with disabilities 2021-2030 - European Commission*. https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/disability/union-equality-strategy-rights-persons-disabilities-2021-2030_en

EU. (2025). *EU countries | European Union*. https://european-union.europa.eu/principles-countries-history/eu-countries_en

Eysink, T. H. S., Van Dijk, A. M., & De Jong, T. (2020). BE COOL! a digital learning environment to challenge and socially include gifted learners. *Educational Technology Research and Development*, *68*(5), 2373–2393. https://doi.org/10.1007/s11423-020-09754-9

Gkiolnta, E., Zygopoulou, M., & Syriopoulou-Delli, C. K. (2023). Robot programming for a child with autism spectrum disorder: A pilot study. *International Journal of Developmental Disabilities*, *69*(3), 424–431. https://doi.org/10.1080/20473869.2023.2194568

Graham, L. (Ed.). (2024). *Inclusive Education for the 21st Century: Theory, policy and practice* (2nd ed.). Routledge. https://doi.org/10.4324/9781003116073

Gunnars, F. (2024). A Systematic Review of Special Educational Interventions for Student Attention: Executive Function and Digital Technology in Primary School. *Journal of Special Education Technology*, *39*(2), 264–276. https://doi.org/10.1177/01626434231198226

Hagberg, B. (2002). Clinical manifestations and stages of Rett syndrome. *Mental Retardation and Developmental Disabilities Research Reviews*, *8*(2), 61–65. https://doi.org/10.1002/mrdd.10020

Hawker, S., Payne, S., Kerr, C., Hardey, M., & Powell, J. (2002). Appraising the Evidence: Reviewing Disparate Data Systematically. *Qualitative Health Research*, *12*(9), 1284–1299. https://doi.org/10.1177/1049732302238251

Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., & Li, T. (2021). *Cochrane Handbook for Systematic Reviews of Interventions*. https://training.cochrane.org/handbook

Home. (2017, June 1). Inclusion Europe. https://www.inclusion-europe.eu/

Jordan, K., & Myers, C. (2022). EdTech and Girls Education in Low- and Middle-Income Countries: Which Intervention Types Have the Greatest Impact on Learning Outcomes for Girls? *Proceedings of the Ninth ACM Conference on Learning @ Scale*, 330–334. https://doi.org/10.1145/3491140.3528305

Juma, R. K., & Ntulo, G. R. (2024). The Availability and Use of Assistive Technologies among Pupils with Hearing and Visual Impairments in Zanzibar. *International Journal of Education and Development Using Information and Communication Technology*, *20*(1), 63–77.

Kasim, M., & Deringöl, Y. (2024). The Impact of Technology-Assisted Mathematical Modeling on a 4th Grade Student with Mathematical Learning Difficulties. *Education and Information Technologies*, *30*(1), 985–1012. https://doi.org/10.1007/s10639-024-13214-9

Kefallinou, A., Symeonidou, S., & Meijer, C. J. W. (2020). Understanding the value of inclusive education and its implementation: A review of the literature. *PROSPECTS*, *49*(3), 135–152. https://doi.org/10.1007/s11125-020-09500-2

Kewalramani, S., Allen, K.-A., Leif, E., & Ng, A. (2024). A Scoping Review of the Use of Robotics Technologies for Supporting Social-Emotional Learning in Children with Autism. *Journal of Autism and Developmental Disorders*, *54*(12), 4481–4495. https://doi.org/10.1007/s10803-023-06193-2

Leonard Cheshire. (2021). *Every Girl's Right: Leonard Cheshire's holistic approach to ensuring every girl receives a quality education*.

Lin, Z., Yang, L., & Zhang, Z. (2018). To include, or not to include, that is the question: Disability digital inclusion and exclusion in China. *New Media & Society*, *20*(12), 4436–4452. https://doi.org/10.1177/1461444818774866

Lorenc, T., Petticrew, M., Whitehead, M., Neary, D., Clayton, S., Wright, K., Thomson, H., Cummins, S., Sowden, A., & Renton, A. (2014). Crime, fear of crime and mental health: Synthesis of theory and systematic reviews of interventions and qualitative evidence. *Public Health Research*, *2*(2), 1–398. https://doi.org/10.3310/phr02020

Lynch, P., Singal, N., & Francis, G. A. (2024). Educational technology for learners with disabilities in primary school settings in low- and middle-income countries: A systematic literature review. *Educational Review*, *76*(2), 405–431. https://doi.org/10.1080/00131911.2022.2035685

Marín, V., Sampedro, B. E., & Morales-Diaz, M. (2025). Secondary Education Teacher's Views on Mixed Reality in Inclusive Environments. *Journal of New Approaches in Educational Research*, *14*. https://doi.org/10.1007/s44322-024-00023-8

Martinez, A. P., & Scherer, J. M. (2018). *(PDF) "Matching Person & Technology (MPT) Model" for Technology Selection as Well as Determination of Usability and Benefit from Use*. https://doi.org/10.13140/RG.2.2.23218.50889

Mihovska, A., Prevedourou, D., Tsankova, J., Manolova, A., & Poulkov, V. (2021). Building Adaptive And Inclusive Education Readiness Through Digital Technologies. *2021 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunication Engineering*, 384–388. https://doi.org/10.1109/ECTIDAMTNCON51128.2021.9425728

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Muharib, R., Walker, V., & Dunn, W. (2024). Effects of Interventions Involving Tablet-Based Speech-Generating Devices for Individuals with ASD: A Meta-analysis. *Journal of Autism and Developmental Disorders*, *54*(12), 4496–4514. https://doi.org/10.1007/s10803-023-06173-6

Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, *18*(1), 143. https://doi.org/10.1186/s12874-018-0611-x

Naneetha, R., & Srihari, M. (2021). A Case Study on Information and Communication Technology in Empowering the Visually Challenged Women in Inclusive Eduction. *Shanlax International Journal of Education*, *9*(4), 374–381. https://doi.org/10.34293/education.v9i4.4208

Navarro-Ibarra, L., Cuevas-Salazar, O., & Robles-Aguilar, A. (2023). Knowledge gaps in education and ICT: A literature review in open access publications. *Contemporary Educational Technology*, *15*(4), ep480. https://doi.org/10.30935/cedtech/13770

Navas-Bonilla, C. del R., Guerra-Arango, J. A., Oviedo-Guado, D. A., & Murillo-Noriega, D. E. (2025). Inclusive education through technology: A systematic review of types, tools and characteristics. *Frontiers in Education*, *10*, 1527851. https://doi.org/10.3389/feduc.2025.1527851

Neul, J. L., Kaufmann, W. E., Glaze, D. G., Christodoulou, J., Clarke, A. J., Bahi-Buisson, N., Leonard, H., Bailey, M. E. S., Schanen, N. C., Zappella, M., Renieri, A., Huppke, P., Percy, A. K., & RettSearch Consortium. (2010). Rett syndrome: Revised diagnostic criteria and nomenclature. *Annals of Neurology*, *68*(6), 944–950. https://doi.org/10.1002/ana.22124

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M.,

Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*, *372*, n71. https://doi.org/10.1136/bmj.n71

Percy, A. K., Lane, J. B., Childers, J., Skinner, S., Annese, F., Barrish, J., Caeg, E., Glaze, D. G., & MacLeod, P. (2007). Rett syndrome: North American database. *Journal of Child Neurology*, *22*(12), 1338–1341. https://doi.org/10.1177/0883073807308715

Petticrew, M., & Roberts, H. (2006). *Systematic Reviews in the Social Sciences: A Practical Guide* (1st ed.). Wiley. https://doi.org/10.1002/9780470754887

Pitchford, N. J., Chigeda, A., & Hubber, P. J. (2019). Interactive apps prevent gender discrepancies in early-grade mathematics in a low-income country in sub-Sahara Africa. *Developmental Science*, *22*(5), e12864. https://doi.org/10.1111/desc.12864

Radici, E., Heboyan, V., Mantovani, F., & De Leo, G. (2022). Attitudes and Perceived Communicative Competence: The Impact of Different AAC Means of Communication among Italian Teenagers. *International Journal of Disability, Development and Education*, *69*(3), 976–986. https://doi.org/10.1080/1034912X.2020.1740185

Rizk, J., & Hillier, C. (2022). Digital technology and increasing engagement among students with disabilities: Interaction rituals and digital capital. *Computers and Education Open*, *3*, 100099. https://doi.org/10.1016/j.caeo.2022.100099

Rizos, I., Foykas, E., & Georgakopoulos, S. V. (2024). Enhancing mathematics education for students with special educational needs through generative AI: A case study in Greece. *Contemporary Educational Technology*, *16*(4), ep535. https://doi.org/10.30935/cedtech/15487

Salas-Pilco, S. Z., Yang, Y., & Zhang, Z. (2022). Student engagement in online learning in Latin American higher education during the COVID-19 pandemic: A systematic review. *British Journal of Educational Technology: Journal of the Council for Educational Technology*, *53*(3), 593–619. https://doi.org/10.1111/bjet.13190

Schnell, J. D. (2017). Web of Science: The First Citation Index for Data Analytics and Scientometrics. In *Research Analytics*. Auerbach Publications.

Schotten, M. (2017). A Brief History of Scopus: The World's Largest Abstract and Citation Database of Scientific Literature. *Research Analytics*. https://www.academia.edu/123177914/A_Brief_History_of_Scopus_The_World_s_Largest_Abstract_and_Citation_Database_of_Scientific_Literature

Singal, N., Lynch, P., Kaye, T., Francis, G., & Francis, N. S., Paul Lynch, Tom Kaye and Gill. (2021, April 23). EdTech for Learners with Disabilities | A Focus on Access, Engagement and Learning Outcomes. *EdTech Hub*. https://edtechhub.org/2021/04/23/edtech-for-learners-with-disabilities-urgent-need-to-focus-on-access-engagement-and-learning-outcomes/

Sorensen, E. K., & Andersen, H. V. (2017). Strengthening Inclusion of Learners with Attention Difficulties Through Interventions with Digital Technology in Processes of Production. *European Journal of Open, Distance and E-Learning*, *20*(1), 45–60. https://doi.org/10.1515/eurodl-2017-0003

Stasolla, F., Perilli, V., Di Leone, A., Damiani, R., Albano, V., Stella, A., & Damato, C. (2014). Technological aids to support choice strategies by three girls with Rett syndrome. *Research in Developmental Disabilities*, *36*, 36–44. https://doi.org/10.1016/j.ridd.2014.09.017

UKaid. (2023). *Using technology to improve girls' learning*.

UN. (2006). *Convention on the Rights of Persons with Disabilities (CRPD) | Division for Inclusive Social Development (DISD)*. https://social.desa.un.org/issues/disability/crpd/convention-on-the-rights-of-persons-with-disabilities-crpd

UN. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs*. https://sdgs.un.org/2030agenda

UNESCO. (1994). *The Salamanca Statement and Framework for Action on Special Needs Education*.

UNFPA. (2018). *Young Persons with Disabilities: Global Study on Ending Gender-based Violence and Realizing Sexual and Reproductive Health and Rights*. https://www.unfpa.org/featured-publication/young-persons-disabilities-global-study-ending-gender-based-violence-and

UNGEI. (2017). *Still left behind: Pathways to inclusive education for girls with disabilities*. https://www.ungei.org/sites/default/files/Still-left-behind-Pathways-to-Inclusion-Girls-With-Disabilities-2017-eng.pdf

UNICEF. (2020). *Accessible and inclusive digital solutions for girls with disabilities | UNICEF*. https://www.unicef.org/reports/accessible-and-inclusive-digital-solutions-girls-disabilities

UNICEF. (2021). *UNICEF Gender Action Plan, 2022–2025 | UNICEF Executive Board*. https://www.unicef.org/executiveboard/documents/UNICEF-Gender-Action-Plan-2022%E2%80%932025-SRS-2021

Waisath, W., McCormack, M., Stek, P., & Heymann, J. (2024). Dismantling barriers and advancing disability-inclusive education: An examination of national laws and policies across 193 countries. *International Journal of Inclusive Education*, *28*(10), 2088–2103. https://doi.org/10.1080/13603116.2022.2058623

Webb, D., Barringer, K., Torrance, R., & Mitchell, J. (2020). *Girls' Education and EdTech: A Rapid Evidence Review* (2). EdTech Hub. https://doi.org/10.5281/zenodo.4737460

Zallio, M., & Ohashi, T. (2022). *The Evolution of Assistive Technology: A Literature Review of Technology Developments and Applications* (arXiv:2201.07152). arXiv. https://doi.org/10.48550/arXiv.2201.07152

Appendix A

List of Keywords and Phrases

Concepts	Related terms
Disability Terms	Blind
	Low vision
	Partially sighted,
	Visually impaired
	Deaf
	Hard of hearing
	Hearing impairment
	Deaf-blind
	Multi-sensory impairment
	Intellectual impairment
	Intellectual disability
	Learning dis*
	Slow learners
	Mental retardation
	Autism spectrum disorder
	PDD-NOS
	Children with communicative multiple disabilities
	CMB
	Attention deficit hyperactivity disorder (ADHD/ADD)
	Cerebral palsy
	Dyslexia
	Dyspraxia
	Physical disability
	Physical impairment
	Physically challenged
	Chronic diseases
	Asthma
	Cancer
	Kidney problems

	Heart problems
	Insuline
	Diabetes
Technology Terms	Technolog*
	Assistive devices
	Assistive aids
	Augmentative and alternative communication (AAC)
	Universal design for Learning (UDL)
	One laptop per child (OLPC)
	Mobile handheld devices
	Smartphone*
	Iphone*
	Tablet*
	Laptop*
	Computer*
	Tv*
	Radio*
	ICT
	AI
School Level Terms	Primary school
	Elementary school
	Primary education
	Elementary education
	Secondary school
	Middle school
	High school
Population Terms	Girl*
	Female*
	Woman
	Women,
	Gender
	Sex

Appendix B

Lorenc and colleagues (2014) followed the procedures of the quality assessment tool for qualitative research developed by Hawker and colleagues (2002). This tool consists of nine questions, each of which can be answered as ‘good,’ ‘moderate,’ ‘weak,’ or ‘very weak.’ The four response categories have been converted into numerical scores:

- 1 point (very weak)

- 2 points (weak)

- 3 points (moderate)

- 4 points (good)

After all questions are answered, a total score can be obtained for each study, ranging from a minimum of 9 points to a maximum of 36 points.

Overall quality ratings are categorised as follows:

- High quality (A): 30–36 points

- Medium quality (B): 24–29 points

- Low quality (C): 9–23 points

The full text of the nine questions in the quality assessment tool can be found in the study by Lorenc et al. (2014).

The results of the quality assessment are presented in *Table 3*. The overall quality ratings of the studies are as follows:

- n = 1 study: Category A (high quality)

- n = 2 studies: Category B (medium quality)

- n = 1 study: Category C (low quality)

Despite being classified in the low-quality category, the study by Andreou et al. (2016) was found to be suitable for inclusion in the study based on its content. Thus, the number of articles included in this systematic review was determined as n = 4.

Results of the quality assessment for qualitative studies (n=4)

Study	**Abstract/ title**	**Introduction/ aims**	**Method/data**	**Sampling**	**Analyss**	**Ethics/bias**	**Results**	**Generalizability**	**Implications**	**Total**	**Grade**
Gkiolnta et al., 2023	3	3	3	2	3	2	3	2	3	24	B
Desideri et al., 2020	3	3	3	2	3	2	3	2	3	24	B
Andreou et al., 2016	3	3	2	2	2	1	3	2	2	20	C
Stasolla et al., 2014	4	4	4	4	4	3	4	3	4	34	A