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Mapping emerging research on computational thinking and disabilities in early childhood and primary education

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Computational thinking (CT) has increasingly been introduced into educational activities involving children with disabilities, particularly through coding toys, educational robotics, unplugged activities, and digital programming environments. However, existing research remains theoretically fragmented and has often focused on tools and interventions rather than critically examining how CT itself is conceptualised and adapted in relation to different disability profiles and educational needs. This focused scoping mini-review examines how CT has been conceptualised, implemented, and pedagogically mediated in empirical research involving children aged 0–12 years with disabilities in early childhood and primary education. By focusing on studies explicitly using the term computational thinking, the review maps how CT is currently conceptualised as a theoretical and pedagogical construct in relation to disability. Following PRISMA-ScR guidelines, a systematic search across eight databases identified 16 studies for inclusion in the final synthesis. The findings revealed substantial heterogeneity across theoretical frameworks, pedagogical approaches, disability profiles, and educational contexts. Most studies adopted widely recognised CT frameworks without substantially adapting them to disability-specific learning characteristics. Interventions frequently relied on robots, programming software, unplugged activities, and tangible interfaces within highly contextualised and small-scale educational settings. The review further highlighted the central role of teachers and researchers in mediating CT activities, while participatory and co-design approaches involving teachers and children remained relatively limited. The review highlights the need for more theoretically coherent, disability-sensitive, and participatory approaches to CT research and practice in inclusive educational contexts.

KEYWORDS

computational thinking, disabilities, early childhood education, educational robotics, focused scoping mini-review, inclusive education, neurodiversity, primary education

1 Introduction

Computational Thinking (CT), first introduced by Wing (2006), is widely recognised as a problem-solving approach involving logical, sequential, and systematic reasoning. It extends beyond programming and includes processes such as decomposition, pattern recognition, abstraction, algorithm design, testing, and debugging. Influential frameworks have conceptualised CT through computational concepts, practices, and

perspectives (Brennan and Resnick, 2012), iterative cognitive processes (Selby and Woollard, 2013), and domain-specific reasoning in mathematics and science education (Weintrop et al., 2016). These frameworks provide a foundation for analysing how CT may be taught, adapted, and mediated in educational contexts.

CT is increasingly acknowledged as a promising approach for supporting learners with disabilities, particularly because it may strengthen sequencing, planning, problem-solving, and structured forms of reasoning (González-González et al., 2019; Taylor, 2018; Taylor et al., 2017). Several studies suggest that coding activities may provide predictable, multimodal, and tangible learning environments that support participation and engagement among children with diverse learning needs (Asbell-Clarke et al., 2024; Prado et al., 2021; Snodgrass et al., 2016). Educational approaches involving coding toys, robots, unplugged activities, and gamified environments have therefore increasingly been explored within both inclusive and specialised educational contexts.

At the same time, existing research remains fragmented across disabilities, educational settings, and theoretical perspectives. While CT has increasingly been introduced into educational activities involving children with disabilities, existing research has often focused on tools, interventions, and implementation strategies rather than critically examining how CT itself is theoretically conceptualized in relation to different disability profiles and learning characteristics. As a result, widely adopted CT frameworks are frequently transferred into disability-related educational contexts without substantial theoretical adaptation or reflection concerning accessibility, participation, communication, or diverse forms of reasoning (Johnson and Phillips, 2018). Furthermore, relatively limited attention has been paid to participatory and collaborative approaches involving teachers and children in the design and mediation of CT activities.

Consequently, there is a need for a broader synthesis of how CT is conceptualised, implemented, and pedagogically mediated in research involving children with disabilities. Mapping these approaches may contribute to identifying current tendencies, theoretical gaps, and future directions for inclusive CT research and practice.

In this review, disability is understood not only as an individual impairment or diagnostic category, but also as a relational phenomenon shaped by the interaction between children's functional profiles, educational environments, available supports, and opportunities for participation. This perspective aligns with contemporary inclusive education research, which emphasises the transformation of learning environments rather than the simple placement of learners with disabilities in existing settings (Ainscow, 2020; UNESCO, 2020). From this perspective, Universal Design for Learning can be understood as one possible pedagogical response to learner diversity, insofar as it draws attention to the reduction of barriers and the provision of flexible pathways for participation and expression (CAST, 2024).

The present study conducts a focused scoping mini-review of empirical research investigating CT in children aged 0–12 years with disabilities within educational contexts. The review aims to examine how CT is theoretically conceptualised, how it is implemented in educational practice, and how the roles of teachers and researchers are described across existing studies.

The review addresses the following research questions:

- RQ1 – How is CT theoretically conceptualised in research involving children with different disabilities?
- RQ2 – How is CT implemented in educational practice, and what tools, materials, and pedagogical approaches are used?
- RQ3 – What roles do teachers and researchers play in the implementation and mediation of CT activities involving children with disabilities?

2 Materials and methods

To address the research questions, a focused scoping mini-review was conducted following the methodological guidance proposed by Peters et al. (2015) and the PRISMA extension for scoping reviews (PRISMA-ScR) (Tricco et al., 2018). Scoping reviews are particularly suitable for mapping emerging and heterogeneous research fields, identifying theoretical tendencies, methodological characteristics, and gaps within the literature. The study selection process is presented in Figure 1.

Prior to the review process, the Open Science Framework (OSF) and the Database of Abstracts of Reviews of Effects were consulted to verify whether similar reviews had already been conducted. No comparable review focusing specifically on CT and disabilities in early childhood and primary education was identified. The review protocol was subsequently registered on the Open Science Framework (https://osf.io/p25eg/overview?view_only=fc7a92a8d99b4f7499547adf128df14a).

The literature search was initially conducted between August and September 2025 and was subsequently updated and expanded in June 2026 to strengthen coverage of education-, computing-, and technology-oriented literature. The final search included eight databases: Scopus, Web of Science, PsycINFO, HAL Science, MathSciNet, ERIC, IEEE Xplore, and ACM Digital Library.

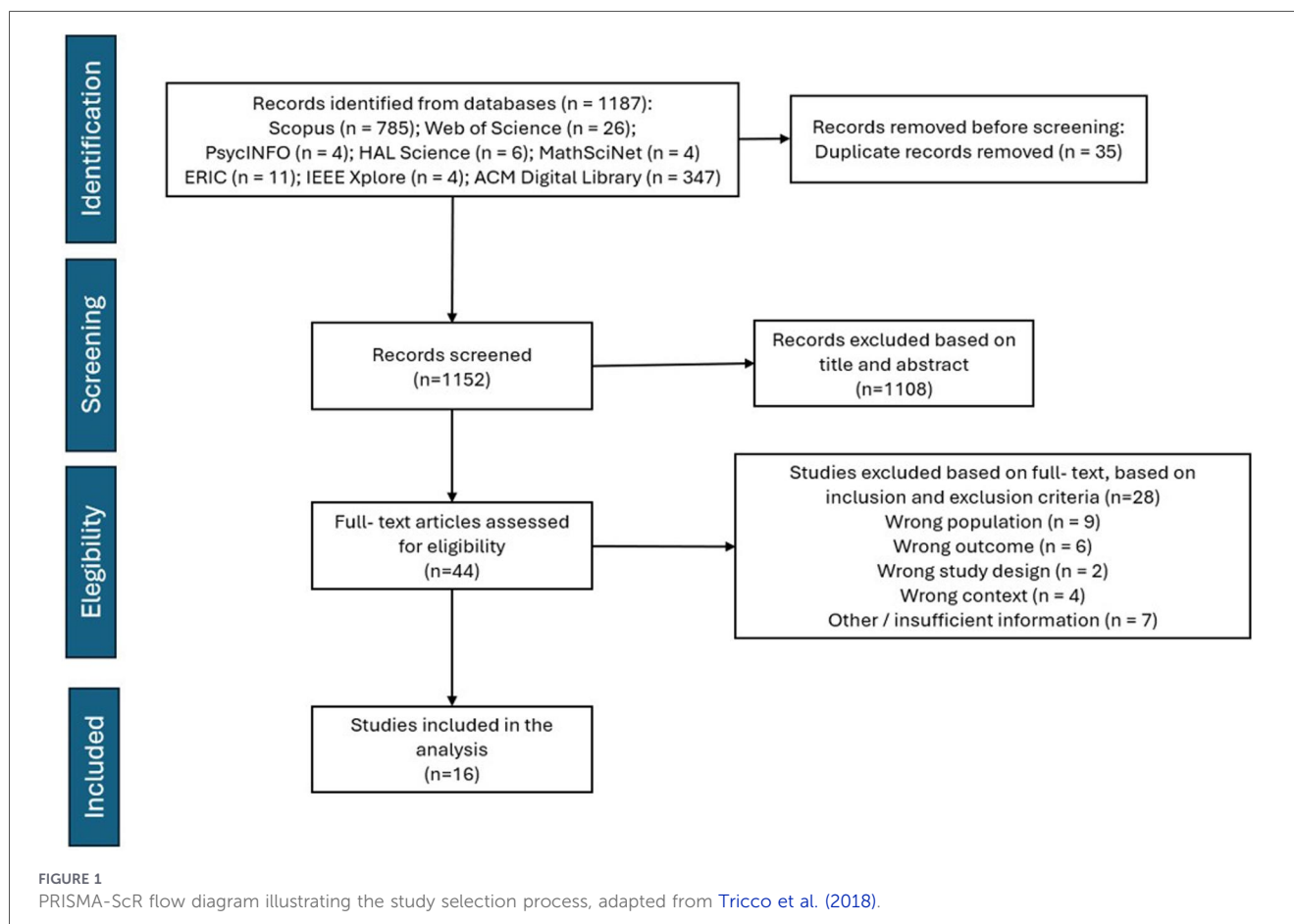
The search strategy was based on conceptual blocks related to computational thinking, age group, educational context, and disability, and was adapted to each database syntax. The core search string was:

“Computational thinking” AND (“child” OR “children” OR “kids” OR “childhood”) AND (“primary school” OR “elementary school” OR “primary education” OR “elementary education” OR “kindergarten” OR “preschool” OR “early childhood education”) AND (“disability” OR “disabilities” OR “disabled” OR “special needs” OR “handicap” OR “learning disabilities”)

To enhance the transparency and reproducibility of the review process, the complete search strategies used for each database are reported in Supplementary Material Table S1.

In ERIC, IEEE Xplore and ACM Digital Library, “computational thinking” was retained as the required conceptual term, while disability- and age-related descriptors were adapted to the syntax and scope of each database.

The search strategy deliberately focused on studies explicitly using the term “computational thinking”, as the aim of the review was not to map all research on coding, programming, educational robotics, or digital making involving children with disabilities, but to analyse how CT is conceptualised,



implemented, and mediated when it is explicitly adopted as a theoretical and pedagogical construct. This criterion is intended to avoid the presumption that all computing-related educational activities necessarily imply CT. At the same time, it is acknowledged that pertinent studies addressing CT-related competencies through associated terminology may have been omitted. Consequently, the findings should be interpreted as a mapping of research explicitly framed through CT, as opposed to a comprehensive review of the entire domain of computing-related educational practices involving children with disabilities.

Studies were included if they:

- were peer-reviewed empirical studies adopting qualitative, quantitative, or mixed-methods approaches;
- involved children aged 0–12 years with disabilities, including intellectual disabilities, autism spectrum disorder (ASD), visual impairments, learning disabilities, ADHD, deafness, or comorbid conditions;
- focused on CT within educational contexts;
- were published in English between 2015 and 2025.

The review adopted the term “disabilities” in accordance with the International Classification of Functioning, Disability and Health ([World Health Organization \[WHO\], 2001](#)), while also drawing on contemporary inclusive education and neurodiversity perspectives. Disability was therefore treated not only as an individual characteristic, but as shaped by the interaction

between children’s functional profiles, educational environments, accessibility, participation, and pedagogical mediation. Categories such as intellectual disability, autism spectrum disorder, ADHD, visual impairment, hearing impairment, and learning disabilities were used as descriptors of the participant groups and support needs reported in the included studies, rather than as fixed explanations of children’s CT competence.

Studies conducted exclusively in clinical or rehabilitative settings were excluded, while educational settings included classrooms, extracurricular educational programmes, and university-supported learning environments were included. Conceptual papers, theoretical articles, editorials, and studies not directly addressing CT were also excluded.

A total of 1,187 records were identified across the database searches. After removing duplicates ($n = 35$), 1,152 records were screened by title and abstract according to the predefined eligibility criteria. Screening was conducted independently by the two authors. 44 full-text articles were subsequently assessed for eligibility, and disagreements regarding inclusion were resolved through discussion until consensus was reached. 28 full-text articles were excluded because they did not meet one or more inclusion criteria. The final corpus consisted of 16 studies. The full search strategies and the number of records retrieved from each database are reported in [Supplementary Table S1](#). Reasons for full-text exclusion are summarised in [Supplementary Table S2](#), and the completed PRISMA-ScR checklist is provided as [Supplementary Table S3](#). For each included study, data extraction focused on bibliographic

information, research methodology, participant characteristics, types of disabilities represented, educational context, duration of the intervention, tools and materials used, theoretical conceptualisations of CT, and the roles attributed to teachers and researchers.

The extracted data were organised in Excel and analysed through descriptive statistics and narrative synthesis in order to identify recurring methodological tendencies, theoretical perspectives, pedagogical approaches, and research gaps across the included studies.

3 Findings

The findings of this Focused scoping mini-review are presented in this section, beginning with a descriptive overview of the studies involved, based on the descriptive statistical analyses performed. This is followed by the answers to the research questions identified, organized through narrative synthesis (Pollock et al., 2023).

3.1 Overview of the included studies

The 16 included studies comprised 11 journal articles, four conference papers, and one book chapter published between 2016 and 2025. The United States was the most represented context, followed by the United Kingdom and Spain, with additional studies conducted in Turkey, Egypt, Kazakhstan, Portugal, India, and Taiwan. The reviewed literature was methodologically heterogeneous, including qualitative, quantitative, mixed-methods, case-study, and design-oriented approaches. Participant samples varied considerably in both size and disability profiles, with intellectual disabilities and autism spectrum disorder most frequently represented, followed by visual impairments, learning disabilities, ADHD, deafness, and broader neurodiversity categories. The heterogeneity of the corpus is a reflection of the emerging and fragmented nature of research explicitly framed through CT in disability-related early childhood and primary education. This variability extends beyond methods and samples to disability types, educational tools, pedagogical approaches, and CT conceptualisations, thereby limiting direct comparison across studies. The characteristics of the included studies are presented in Table 1.

3.2 Computational thinking conceptualizations across disabilities: theoretical frameworks and variations (RQ1)

Across the reviewed studies, CT was most often conceptualized through widely established theoretical frameworks such as those proposed by Wing (2006) and Brennan and Resnick (2012). Several reviewed studies explicitly referred to a recognized theoretical model of CT, while the remaining studies used terminology associated with CT processes—such as decomposition, sequencing, debugging, or algorithmic thinking—without clearly identifying a specific framework. Wing's (2006) conceptualization of CT was the most frequently adopted reference, appearing in eight studies. In some cases, it was integrated with later contributions such as

Brennan and Resnick's (2012) framework of computational concepts, practices, and perspectives.

Despite this apparent theoretical consistency, relatively few studies explicitly reconsidered CT frameworks in relation to the cognitive, sensory, communicative, motor, or learning characteristics associated with different disabilities. In most cases, disability was primarily discussed in terms of barriers, accommodations, or implementation challenges. For example, studies involving children with intellectual disabilities and Down syndrome frequently identified challenges related to working memory, information processing, abstraction, and generalization (González-González et al., 2019; Taylor, 2018; Taylor et al., 2017). In response, researchers proposed highly structured and scaffolded activities characterized by explicit instruction, short tasks, immediate feedback, concrete materials, and step-by-step progression. Similar tendencies emerged in studies involving autism spectrum disorder (ASD), where predictable structures, visual supports, and highly organized environments were often emphasized. These adaptations are pedagogically relevant, but they mostly operate at the level of access, mediation, and implementation rather than at the level of the theoretical construct of CT itself.

This distinction is important because adapting tools, instructions, or scaffolds does not necessarily imply adapting the CT framework. The issue is not whether CT should be redefined separately for each disability category, nor whether expectations should be lowered for children with disabilities. Rather, a disability-sensitive approach requires distinguishing between the core dimensions of CT and the specific modalities through which CT is accessed, mediated, expressed, assessed, and developed. Without this distinction, differences in communication, perception, movement, working memory, or task progression may be mistaken for an absence of CT competence. Moreover, it becomes difficult to determine whether children have actually acquired and developed CT, or whether particular strategies, scaffolds, or accommodations have substantially transformed the competence being observed.

At the same time, relatively few studies explored whether particular disability profiles might also be associated with specific ways of engaging with CT processes. In this regard, Asbell-Clarke et al. (2024) represented a notable exception by adopting a neurodiversity-oriented interpretation of CT. Rather than treating neurodivergence only through a deficit-oriented lens, the authors suggested that some cognitive characteristics may interact with CT processes in meaningful ways. However, these interpretations should be treated cautiously, as the available evidence remains limited and is based on a small number of studies. Further research is needed before robust conclusions can be drawn about possible relationships between specific neurodivergent profiles and particular dimensions of CT. This perspective can be seen in accordance with neurodiversity-informed approaches, which question deficit-oriented interpretations of difference and draw attention to how cognitive variation may shape participation, learning, and expression in educational contexts (Pellicano and den Houting, 2022). In that study, attention to detail and preference for structure were hypothesised as potentially supportive of decomposition and algorithmic reasoning, while more divergent forms of thinking associated with ADHD were tentatively discussed in relation to exploratory and creative dimensions of CT. This perspective

TABLE 1 Characteristics of the included studies.

Study	Country	Methodology	Participants	Disabilities	CT
Snodgrass et al. (2016)	USA	Qualitative (cross-case analysis)	11 students	Mixed (ID, LD, ASD)	Software (Code.org, Scratch) – no robots
Taylor et al. (2017)	USA	Quantitative (single-subject, changing criterion)	4 children	Down syndrome (ID)	Robots (KIBO) + Software (Blockly)
Taylor (2018)	USA	Quantitative (single-subject)	6 students	ID	Robots (Dash, KIBO) + Software
González-González et al. (2019)	Spain	Qualitative (exploratory study)	6 students	Down syndrome (ID)	Robots (KIBO)
Morrison et al. (2020)	UK	Qualitative (design-based research)	14 students	Visual impairment	Torino (tangible programming language)
India et al. (2020)	India	Qualitative study based on semi-structured play sessions	12 children	Blindness / visual impairment	Tangible programming environment (Project Torino / Code Jumper)
Morrison et al. (2021)	UK	Qualitative (large-scale study)	364 students	Visual impairment	Torino
Prado et al. (2021)	USA	Mixed methods	23 students	ASD, ADHD, gifted	Unplugged+Software (MakeyMakey +Scratch)
Cano et al. (2021)	Spain	Mixed methods	16 students	Deafness	Serious game (Perdi-Dogs) + Unplugged
Li et al. (2021)	Taiwan	Case study / teaching experiments	3 children	Autism	Social story teaching aid+Makey Makey
Yildiz and Çengel (2022)	Turkey	Quantitative (pre-post experiment)	12 children	ID (preschool)	Unplugged+Robots (U-Bot)
Elshahawy et al. (2022)	Egypt	Quantitative (quasi-experimental)	42 students	ASD	Software (Gamified platform)
Assainova et al. (2023)	Kazakhstan	Quantitative	30 students	Cognitive/mental disabilities ($\approx$ ID)	Software (Wordwall, Miro, Code.org, Scratch)
Rocha et al. (2023)	Portugal	Mixed methods	16 students	Mixed visual disabilities	Tangible Sokoban kit (self-produced tangible materials)
Asbell-Clarke et al. (2024)	USA	Mixed methods (large-scale study)	>90 students	Neurodiversity (ASD, ADHD, LD...)	Unplugged+Robots (Sphero) + Software (Zoombinis)
Das et al. (2025)	USA	Qualitative deployment study / interaction analysis	12 neurodivergent and 17 neurotypical preschoolers	Neurodivergence	Robots (KIBO) + social play

resonates with inclusive and capability-oriented approaches, which shift attention from deficits alone towards the educational conditions that enable children with disabilities to participate, exercise agency, and develop meaningful forms of reasoning.

The updated corpus also reinforced the need to distinguish between CT as a conceptual construct and the different modalities through which children access, express, and participate in CT activities.

Overall, the findings suggest that research concerning CT and disabilities is still characterised by limited theoretical adaptation and a lack of fully disability-sensitive conceptualisations of CT. Future research should move beyond simply transferring general CT models into disability-related contexts. Instead, it should explore how different cognitive, sensory, communicative, motor, and participatory profiles may reshape understandings of CT itself. This would not only support more inclusive educational design, but also enable a more accurate assessment of how and whether CT is acquired and expressed by children with disabilities.

3.3 Promotion of computational thinking in educational practice: tools, robots, and materials (RQ2)

The reviewed studies revealed substantial heterogeneity in how CT was implemented in educational practice. Activities involved robots, programming software, unplugged tasks, tangible interfaces, and gamified environments, often combined in multimodal approaches. Across studies, these tools can be interpreted primarily as accessibility mediators: they were used to make CT activities more reachable, understandable, and participatory for children with different function profiles. However, the forms of accessibility pursued varied according to the learners' functioning across cognitive, sensory, communicative, and motor domains.

In studies involving children with intellectual disabilities and Down syndrome, accessibility was frequently pursued through tangible robots (KIBO, Dash, U-Bot), combined with structured tasks, repetition, immediate feedback, and concrete

manipulation (González-González et al., 2019; Taylor, 2018; Taylor et al., 2017; Yildiz and Çengel, 2022). Studies involving ASD, ADHD, or broader neurodiverse samples adopted more varied approaches, including gamified environments, unplugged activities, physical computing, and programming software often to support predictability, engagement, multimodal participation, and flexible interaction (Asbell-Clarke et al., 2024; Elshahawy et al., 2022; Prado et al., 2021).

In studies involving visual impairments, accessibility required a more substantial transformation of the sensory channels through which CT was accessed, leading to tangible and auditory systems such as Torino or Tangible Sokoban (Morrison et al., 2020, 2021; Rocha et al., 2023). The only study involving deaf students combined unplugged activities with a serious game designed to support visual communication (Cano et al., 2021).

The updated corpus further broadened the range of tools and materials considered in the review. Das et al. (2025), for example, foregrounded neurodiverse preschoolers' participation in social play with KIBO, while India et al. (2020) showed how tangible and auditory programming environments can support access to CT concepts for blind and low-vision children. Li et al. (2021) represented a more targeted case-study approach, using CT principles in connection with social story activities for autistic children. The main issue is that no stable teaching method emerged across studies, even when similar disability profiles were considered. This suggests that the field is still characterised by local experimentation rather than by shared teaching methods or design principles. While this variability partly reflects the heterogeneity of children's functional profiles, the absence of common reference frameworks makes it difficult to identify which tools, supports, and teaching methods are most appropriate for specific needs. It also limits the possibility of developing teacher education that is grounded in empirical evidence rather than in isolated examples of practice.

3.4 Teachers and researchers as designers, mediators, and facilitators in computational thinking interventions (RQ3)

The analysis highlighted the central yet variable role of teachers and researchers in CT activities involving children with disabilities. In most studies, teachers acted primarily as facilitators or implementers of interventions designed by researchers. Researchers typically selected tools, developed activities, provided training, structured the intervention, and evaluated outcomes, while teachers supported implementation within educational settings (Asbell-Clarke et al., 2024; Cano et al., 2021; Elshahawy et al., 2022; González-González et al., 2019; Morrison et al., 2021; Snodgrass et al., 2016; Yildiz and Çengel, 2022).

The additional studies further reinforced the central role of adults and researchers in designing accessible CT environments, structuring activities, adapting materials, and mediating children's participation. This was evident in the design of tangible programming environments for blind and low-vision children (India et al., 2020), social-story-based activities for autistic children (Li et al., 2021), and robot-mediated social play with neurodiverse preschoolers

(Das et al., 2025). Fewer studies adopted participatory or collaborative approaches in which teachers contributed actively to adapting or co-designing interventions (Morrison et al., 2020; Prado et al., 2021; Rocha et al., 2023). These studies suggest that collaboration may support interventions that are more responsive to classroom conditions, existing pedagogical practices, and the diverse needs of students with disabilities. Such approaches align with participatory design perspectives, which emphasise collaboration among researchers, educators, and stakeholders throughout the design process (DiSalvo et al., 2017).

Children themselves were rarely positioned as contributors to the design of CT activities. Even in studies explicitly addressing inclusion, children with disabilities were usually described as participants rather than as actors capable of influencing activity goals, structures, or implementation. This points to a need for more participatory and sustainable approaches that involve teachers and children more actively in the development of CT practices.

4 Limitations

This review has several limitations. Only studies published in English between 2015 and 2025 were included, which may have excluded relevant research in other languages or earlier studies. The reviewed literature was highly heterogeneous in terms of methodologies, participant profiles, educational contexts, disability types, tools, and theoretical perspectives, limiting direct comparison across studies. Although this review did not include a formal assessment of methodological quality, the robustness of the evidence should be interpreted cautiously due to the small and heterogeneous final corpus. Several studies relied on very small samples or exploratory designs, and, even when quantitative designs were used, limited sample sizes reduced generalisability. These characteristics confirm the emerging nature of the field, suggesting that conclusions should be viewed as indications of current tendencies rather than as consolidated evidence. The very small samples in several included studies have important implications for the interpretation of the findings. Studies involving only three to six participants can provide valuable exploratory insights into possible pedagogical approaches, accessibility adaptations, and forms of mediation, but they do not allow strong conclusions about the effectiveness or transferability of specific tools, methods, or CT frameworks. The findings should therefore be interpreted as indicative of emerging tendencies and design possibilities rather than as robust evidence of generalisable educational effects.

Finally, the search strategy focused on studies explicitly referring to CT. Relevant studies using related terms such as coding, programming, educational robotics, digital making, or inclusive computing may therefore not have been included. Although the search was updated and expanded in June 2026 to include ERIC, IEEE Xplore, and ACM Digital Library, the review remained deliberately focused on studies explicitly adopting computational thinking as a theoretical or pedagogical construct. This delimitation was chosen to avoid assuming that all computing-related educational activities necessarily imply CT. The findings should therefore be interpreted as a mapping of research explicitly framed through CT, rather than as a comprehensive review of the broader field of computing-related educational practices.

5 Conclusions and future directions

This focused scoping mini-review examined how CT has been conceptualised, implemented, and pedagogically mediated in research involving children with disabilities in early childhood and primary education. The findings suggest that the field remains emerging, heterogeneous, and theoretically fragmented. Although the reviewed studies demonstrate the potential of CT activities to support participation through structured, multimodal, and accessible learning experiences, most studies adopted recognised CT frameworks without substantially adapting them to disability-specific cognitive, sensory, or communicative characteristics.

Future research needs to clarify how the core dimensions of CT can be recognised, supported, and assessed across different cognitive, sensory, communicative, and motor profiles, without confusing children's ways of accessing or expressing computational reasoning with the absence of CT competence. This requires greater use and further development of disability-sensitive frameworks, stronger empirical evidence, and participatory research involving teachers and children in the design of inclusive CT practices.

Author contributions

SC: Conceptualization, Data curation, Formal analysis, Methodology, Software, Writing – original draft. FG: Conceptualization, Funding acquisition, Project administration, Software, Supervision, Validation, Writing – review & editing.

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References

- Ainscow, M. (2020). Promoting inclusion and equity in education: lessons from international experiences. *Nord. J. Stud. Educ. Policy* 6 (1), 7–16. doi: 10.1080/20020317.2020.1729587
- Asbell-Clarke, J., Dahlstrom-Hakki, I., Voiklis, J., Attaway, B., Barchas-Lichtenstein, J., Edwards, T., et al. (2024). Including neurodiversity in computational thinking. *Front. Educ.* 9, 1358492. doi: 10.3389/feduc.2024.1358492
- Assainova, A., Abykenova, D., Aubakirova, Z., Mukhamediyeva, K., and Kozhageldinova, K. (2023). Web technologies in the development of computational thinking of students with mental disabilities. *Int. J. Emerg. Technol. Learn.* 18 (11), 74–92. doi: 10.3991/ijet.v18i11.38653
- Brennan, K., and Resnick, M. (2012). “New frameworks for studying and assessing the development of computational thinking,” in *Proceedings of the 2012 Annual Meeting of the American Educational Research Association* (American Educational Research Association).

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was used in the creation of this manuscript. ChatGPT was used for proofreading. The authors reviewed and edited the output and take full responsibility for the content of the published article.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2026.1898052/full#supplementary-material>

SUPPLEMENTARY TABLE S1

Search strings and records identified for each database.

SUPPLEMENTARY TABLE S2

Reasons for exclusion at full-text stage.

SUPPLEMENTARY TABLE S3

Completed PRISMA-ScR checklist.

- Cano, S., Naranjo, J. S., Henao, C., Rusu, C., and Albiol-Pérez, S. (2021). Serious game as support for the development of computational thinking for children with hearing impairment. *Appl. Sci.* 11 (1), 115. doi: 10.3390/app11010115

CAST. (2024). Universal Design for Learning Guidelines version 3.0. Available online at: <https://udlguidelines.cast.org> (Accessed July 5, 2026).

- Das, M., Tran, M., Ong, A. C.-H., Kientz, J. A., and Feldner, H. (2025). “Cultivating computational thinking and social play among neurodiverse preschoolers in inclusive classrooms,” in *CHI Conference on Human Factors in Computing Systems (CHI '25)* (ACM), 1–22. doi: 10.1145/3706598.3713851

- DiSalvo, B., Yip, J., Bonsignore, E., and DiSalvo, C. (2017). “Participatory design for learning,” in *Participatory Design for Learning: Perspectives from Practice and Research*, eds. B. DiSalvo, J. Yip, E. Bonsignore, and C. DiSalvo (New York, NY: Routledge), 1–17.

- Elshahawy, M., Bakhaty, M., Ahmed, G., Aboelnaga, K., and Sharaf, N. (2022). "Towards developing computational thinking skills through gamified learning platforms for students with autism," in *Learning with Technologies and Technologies in Learning: Experience, Trends and Challenges in Higher Education*, (Cham: Springer International Publishing), 193–216. doi: 10.1007/978-3-031-04286-7_10
- González-González, C. S., Herrera-González, E., Moreno-Ruiz, L., Reyes-Alonso, N., Hernández-Morales, S., Guzmán-Franco, M. D., et al. (2019). Computational thinking and down syndrome: an exploratory study using the KIBO robot. *Informatics* 6 (2), 25. doi: 10.3390/informatics6020025
- India, G., Ramakrishna, G., Pal, J., and Swaminathan, M. (2020). "Conceptual learning through accessible play: project torino and computational thinking for blind children in India," in *Information and Communication Technologies and Development (ICTD '20)* (ACM), 1–11. doi: 10.1145/3392561.3394634
- Johnson, N., and Phillips, M. (2018). Rayyan for systematic reviews. *J. Electron. Resour. Libr.* 30 (1), 46–48. doi: 10.1080/1941126X.2018.1444339
- Li, X.-Z., Chen, C.-C., and Kang, X. (2021). "Design of social story teaching aid for autistic children based on computational thinking and its case study," in *2021 2nd International Conference on Computing, Networks and Internet of Things (CNIOT 2021)* (ACM), 1–6. doi: 10.1145/3468691.3468712
- Morrison, C., Villar, N., Hadwen-Bennett, A., Regan, T., Cletheroe, D., Thieme, A., et al. (2021). Physical programming for blind and low vision children at scale. *Hum.-Comput. Interact.* 36 (5–6), 535–569. doi: 10.1080/07370024.2019.1621175
- Morrison, C., Villar, N., Thieme, A., Ashktorab, Z., Taysom, E., Salandin, O., et al. (2020). Torino: a tangible programming language inclusive of children with visual disabilities. *Hum.-Comput. Interact.* 35 (3), 191–239. doi: 10.1080/07370024.2018.1512413
- Pellicano, E., and den Houting, J. (2022). Annual research review: shifting from 'normal science' to neurodiversity in autism science. *J. Child Psychol. Psychiatry* 63 (4), 381–396. doi: 10.1111/jcpp.13534
- Peters, M. D. J., Godfrey, C. M., Khalil, H., McInerney, P., Parker, D., and Soares, C. B. (2015). Guidance for conducting systematic scoping reviews. *Int. J. Evid. Based. Healthc.* 13 (3), 141–146. doi: 10.1097/XEB.0000000000000050
- Pollock, D., Peters, M. D. J., Khalil, H., McInerney, P., Alexander, L., Tricco, A. C., et al. (2023). Recommendations for the extraction, analysis, and presentation of results in scoping reviews. *JBI Evidence Synthesis* 21 (3), 520–532. doi: 10.11124/JBIES-22-00123
- Prado, Y., Jacob, S., and Warschauer, M. (2021). Teaching computational thinking to exceptional learners: lessons from two inclusive classrooms. *Comput. Sci. Educ.* 32 (2), 188–212. doi: 10.1080/08993408.2021.1914459
- Rocha, F., Correia, F., Neto, I., Pires, A. C., Guerreiro, J., Guerreiro, T., et al. (2023). "Coding together: on co-located and remote collaboration between children with mixed-visual abilities," in *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (Article 606)* (ACM). doi: 10.1145/3544548.3581261
- Selby, C., and Woollard, J. (2013). *Computational Thinking: The Developing Definition*. Southampton: University of Southampton.
- Snodgrass, M. R., Israel, M., and Reese, G. C. (2016). Instructional supports for students with disabilities in K-5 computing: findings from a cross-case analysis. *Comput. Educ.* 100, 1–17. doi: 10.1016/j.compedu.2016.04.011
- Taylor, M. S. (2018). Computer programming with pre-K through first-grade students with intellectual disabilities. *J. Spec. Educ.* 52 (2), 78–88. doi: 10.1177/0022466918761120
- Taylor, M. S., Vasquez, E., and Donehower, C. (2017). Computer programming with early elementary students with down syndrome. *J. Spec. Educ. Technol.* 32 (3), 149–159. doi: 10.1177/0162643417704439
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., et al. (2018). PRISMA Extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann. Intern. Med.* 169 (7), 467–473. doi: 10.7326/M18-0850
- UNESCO (2020). *Global education monitoring report 2020: inclusion and education: all means all*. UNESCO.
- Weintrop, D., Beheshti, E., Horn, M., Orton, K., Jona, K., Trouille, L., et al. (2016). Defining computational thinking for mathematics and science classrooms. *J. Sci. Educ. Technol.* 25 (1), 127–147. doi: 10.1007/s10956-015-9581-5
- Wing, J. M. (2006). Computational thinking. *Commun. ACM*. 49 (3), 33–35. doi: 10.1145/1118178.1118215
- World Health Organization (2001). *International Classification of Functioning, Disability and Health (ICF)*. Geneva: World Health Organization.
- Yildiz, E. P., and Çengel, M. (2022). An experimental study in determining basic robotic coding skills of pre-school students with intellectual disabilities. *Int. J. Interact. Mob. Technol.* 16 (23), 85–102. doi: 10.3991/ijim.v16i23.36077