Integrating Digital Health Services and Special Education to Support Students with Disabilities: A Focused Scoping Review with Implications for Saudi Arabia

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ABSTRACT

Background. Students with disabilities may receive clinical and rehabilitation services from providers outside their schools. Digital delivery offers several ways to connect those providers with educators and families, and the type of coordination affects which outcomes should be measured.

Objective. To map how digital clinical and rehabilitation services work with school teams, identify the outcomes evaluated, and inform the design of a model for Saudi Arabia.

Methods. Europe PMC and ERIC were searched for English-language empirical journal reports from 2015 through 28 October 2026. Eligible reports described a digital service with a defined school role. One reviewer screened records and full texts. Findings were charted and synthesized narratively without formal critical appraisal. Reports from the same program were grouped when interpreting the evidence.

Results. Forty-three reports covered referral and assessment, school teletherapy, behavioral support across school and home, and shared planning. Comparative studies supported selected gains in service access or condition-specific outcomes. Many reports addressed feasibility, user experience, or changes without a comparison group. Evidence for sustained classroom participation or academic progress was insufficient. No included report evaluated implementation in Saudi Arabia. Sixty-five reports sought for full-text review could not be retrieved.

Conclusions. A Saudi model could be co-designed with students, families, educators, and clinicians and tested locally. It could specify who coordinates services, how shared goals are agreed, and how school staff are supported. Evaluations should measure educational participation alongside access, clinical, and implementation outcomes. The restricted search, incomplete retrieval, and single-reviewer screening limit the scope of the findings.

Keywords: digital health; special education; disability; interprofessional collaboration; telepractice; scoping review; Saudi Arabia

INTRODUCTION

Some students with disabilities need communication therapy and/or rehabilitation as well as behavior support and clinical assessment alongside school education. All these services are delivered by different teams with different schedules and information systems. A working interface between these services and the school or early childhood education and care team and the student and the student's family is required. This could be a referral from school following a school screening, an assessment by a clinician that includes

contributions from a student's teachers, therapy sessions that are supported by school staff, coaching of school staff by a clinician, sharing of functional goals for shared outcomes and feedback between settings.

Instead of a single intervention, digital delivery offers a variety of different interfaces to deal with different purposes. A school hearing-screening pathway might connect children and their families with specialists; for example, a therapist could guide a local facilitator to deliver a session, or a clinician could coach teachers and parents to work towards the same behavioral goals. Again, different purposes mean that there are different outcome measures of value. Completion of specialist follow-up would be an access outcome, for example; teacher confidence, platform usability and attendance would be implementation outcomes, for example, and none of these alone would indicate improved learning or participation of children and young people.

School health services connect students in primary and secondary education with health workers, either at school or through services based outside the school (World Health Organization, 2021). In inclusive primary schools, Jeremy et al. (2024) identified a clear purpose and measurable intended outcomes as important features of collaboration between teachers and therapists. These perspectives frame the present review's focus on how school staff, clinicians, and families coordinate referral, service delivery, and follow-up through digital services.

In the present review, service interfaces are mapped across a variety of heterogeneous studies to answer the following questions: 1) what populations, settings and mechanisms of coordination have been studied in various digital health interventions; 2) what access, clinical, educational and implementation outcomes have been studied and measured in the various digital health interventions; and 3) what design ideas could be applicable and utilized in formulating a Saudi model that would go through the phases of co-design and evaluation.

METHODS

A focused scoping approach was used to accommodate experiments, service evaluations, surveys, qualitative studies, development reports and empirical secondary analyses. Reporting follows the PRISMA extension for scoping reviews where applicable (Tricco et al., 2018). No prospectively registered review protocol or externally peer-reviewed search strategy was available. Eligibility boundaries were operationalized during the review update, and the resulting decisions are documented at record level in Supplementary File 1. This limitation is relevant when interpreting the breadth of the map.

Europe PMC and ERIC were searched on 28 October 2026. Coverage began on 1 January 2015. Europe PMC was queried through its public search API using title/abstract terms for digital delivery, schools and disability-related needs. ERIC was queried through its public API using corresponding terms, publication years 2015-2026 and its peer-reviewed flag. The ERIC year restriction is an inclusive year filter, rather than a daily publication-date filter. Exact query strings, API request URLs, timestamps, response hashes and source totals are supplied in Appendix A and Supplementary File 1. No Arabic-language, regional database or comprehensive allied-health database search was conducted.

A report was eligible if it was an English-language, peer-reviewed empirical journal report; involved preschool or school-age students with disabilities or identified disability-related service needs, or a condition-specific school clinical-screening pathway; and described a digital clinical or rehabilitation function with an identifiable school-team role. Roles could include referral, diagnostic information contribution, local facilitation, clinician-led behavioral consultation, therapy implementation or shared planning. Relevant adult stakeholder samples were eligible when their findings described these services. Mixed-age reports were retained only when the school or pediatric service interface was identifiable; age-specific treatment effects were not inferred from mixed samples.

School age, school recruitment, an educator's professional background, or a teacher-rated research outcome alone was insufficient. Reports were excluded when digital technology was used only for research interviews or assessment without a school-service interface, when the activity was education or health

instruction without a disability-related clinical service, or when the source was a review, protocol, editorial or other nonempirical item. Infant-only services without an early-childhood special education interface and exclusively preservice or adult services were outside scope. Development and co-design studies were eligible when they empirically examined a defined condition-specific digital service or tool with a school role; these were not treated as effectiveness studies.

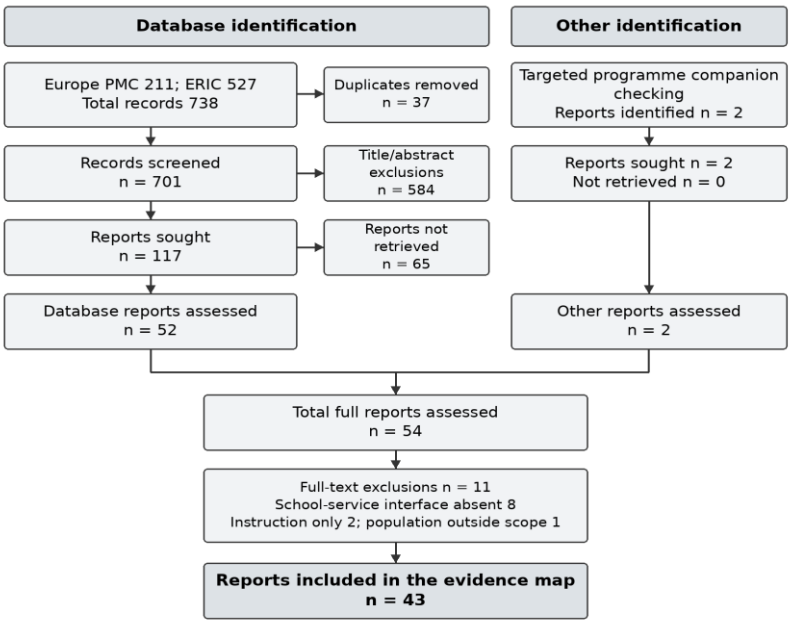
We removed 37 exact normalized-title duplicates using the rules in Appendix A. One reviewer screened all titles and abstracts, assessed retrieved full texts against the eligibility criteria, and checked bibliographic and source details. Supplementary File 1 records decisions for the current update. Earlier screening decisions that had not been recorded could not be reconstructed.

Reports were sought via the public repository for the report (where available), the publisher's and journal's web pages for the report, or via direct link from the published article's abstract or front page. An abstract or a page showing only references and declarations was not counted as a retrieved report. Reports that remained inaccessible were classified as not retrieved (as opposed to being ineligible for inclusion in the review). In targeted verification of the named program companion reports, two further reports were identified, on the Flex feasibility study and the open CLS-R-FUERTE trial. The identification of these reports was not a comprehensive citation search.

A range of fields were charted for reports including: publication identifier, setting, design and sample size, digital function, school and clinical roles, main findings, limitations of interpretation, whether a related program had been published, funding, and authors' competing interests. Statements were checked in the text under examination; those not located in that text have been recorded as such. In terms of pathway assignments, each report was counted once in descriptive counts for primary pathways through the review. Findings have been reported from within samples (and thus not combined together) and from program companions (as distinct from independent replications).

Studies were summarized for access (i.e. use of service), clinical (i.e. symptom/behavior change), educational (i.e. classroom/school learning) and implementation (i.e. acceptability/feasibility, confidence, fidelity, burden/usability) outcomes. No assessment of risk of bias, grading of certainty, or meta-analysis was conducted. Therefore, this review could not provide a summary of findings to determine treatment effect or provide recommendations for clinical use. However, study design limitations were described for each study.

Figure 1 Record and Report Flow for the 28 October 2026 Update



Note. Record and report flow for the 28 October 2026 update. Reports describe publications; programme

companions are not counted as independent replications. The full-text exclusion reasons are mutually exclusive primary reasons.

RESULTS

After deduplication, 701 database records were screened and 584 were excluded at title/abstract triage. Full reports were sought for 117 database records; 52 were retrieved and 65 were not retrieved. Both additionally identified companion reports were retrieved, giving 54 reports for full-text assessment.

Eleven were excluded: eight lacked an eligible school-service interface, two described instruction without an eligible clinical service, and one did not identify an eligible disability/service-need population. Forty-three reports were included. Figure 1 summarizes the flow; Supplementary File 1 lists all screening decisions, duplicate links, retrieval attempts, exclusions and included-report characteristics.

Evidence pathways and coordination mechanisms

The 43 reports were distributed across four primary pathways (Table 1). They covered school hearing services, communication therapy, autism-related support, ADHD and behavioral care, neurodisability rehabilitation and vision-related services.

Reports came from several international settings; none of the retrieved eligible reports evaluated implementation in Saudi Arabia. This observation is restricted to the present search and retrieved corpus. It is not evidence that no relevant Saudi work exists.

Table 1 Evidence Pathways and Coordination Mechanisms

Primary pathway	Reports	School and clinical interface	Outcome interpretation
Referral and assessment	9	Condition-specific screening, school referral, educator diagnostic information and specialist follow-up.	Access and diagnostic outcomes; classroom benefit requires separate measurement.
School teletherapy and facilitation	12	Remote therapy with local assistance, related-service workforce preparation and school-linked specialist treatment.	Clinical function, service delivery and facilitator perspectives; designs vary.
Behavioral school-home care	15	Clinician training, teacher and parent coaching, shared behavior goals, report cards and consultation.	Symptoms, implementation and engagement; programme packages differ.
Shared planning and continuity	7	Shared portals, multidisciplinary communication and school-related therapy continuity.	Predominantly perceptions, access experiences and usability.

Note. Mutually exclusive primary pathway assignments for descriptive counts. A report can address several coordination functions and outcome domains. Detailed report-level charting appears in Supplementary File 1.

Referral and Assessment

In Hearing Norton Sound, school screening was linked to specialist telemedicine referral in 15 Alaska communities. The main cluster-randomized trial included 1,481 screened children; among those referred, follow-up within nine months was reported for 268/391 in the telemedicine arm and 128/399 in the standard-referral arm (Emmett et al., 2022). An ancillary preschool analysis in 14 communities included 153 screened children and 71 referrals, with follow-up for 30/39 versus 16/32 referred children (Robler et al., 2023). Because the preschool analysis reused community allocation, it is not an independent replication of randomization. Community-design and qualitative reports further identified communication failures, travel burden and the need for locally acceptable pathways (Inglis-Jenson et al., 2023; Robler et al., 2020).

Other pathways broadened the map beyond videoconferencing. A Nicaraguan evaluation linked community-worker tablet audiometry at schools, asynchronous specialist review and mobile reminders (Saunders et al., 2022). A South African within-subject study of 73 pupils reported 65.2% sensitivity for its automated screening approach, illustrating that feasibility does not guarantee case detection (Govender et al., 2018). Telehealth family navigation connected primary care with Early Intervention/Early Childhood Special Education in a small site-randomized pilot (Zuckerman et al., 2025). Digital parent and teacher questionnaires also contributed to clinical ADHD classification, but predictive accuracy was not evidence of better classroom functioning (Grazioli et al., 2024; Weng Hui et al., 2024). An Appalachian qualitative study emphasized adaptation of communication and coordination, rather than reproduction of the Alaska effect estimate (Oberman et al., 2026).

School Teletherapy and Local Facilitation

School-based speech-language and occupational therapy typically depended on local scheduling, equipment, assistance and communication with families. Langbecker et al. (2019) evaluated 98 children in five rural schools and reported improved teacher-rated speech, language and classroom participation after therapy. The evaluation had no concurrent control group, used a programme-specific composite measure and allowed concurrent in-person therapy. It therefore cannot attribute the observed change to digital delivery or establish durable academic benefit. Retrospective school service comparisons found broadly comparable functional communication changes across delivery modes, but nonrandomized provider datasets do not establish formal equivalence (Musaji et al., 2021). A Dutch historical-cohort comparison concerned specialist dyslexia treatment after persistent school-identified difficulties, rather than generic online literacy instruction (Verwimp et al., 2024).

Workforce and family reports indicated that implementation was relational as well as technical. Interviews with school executives and assistants highlighted communication and role preparation (Fairweather et al., 2017). Competency and workforce studies described facilitator responsibilities, training needs and technology access (Douglass et al., 2021; Hermes et al., 2021; Ashok Kumar et al., 2023). Hong Kong students and parents reported preferences and perceived efficacy of school speech-language telepractice (Lam et al., 2021). Related AAC survey reports distinguished perceived effectiveness from professional confidence; the reports were not independent child-effectiveness studies (Biggs, Rossi, et al., 2022; Biggs, Therrien, et al., 2022). Descriptive allied-health placement cases illustrated feasible school support, but student placement completion was not a child clinical outcome (Salter et al., 2020).

Behavioral Support across School And Home

The CLS programme family combined clinician preparation, school-home behavioral strategies and feedback. A Mexican eight-school cluster-randomized trial included 57 children and associated parents, teachers and clinicians, and found improvements in rated ADHD-related outcomes relative to usual school services (Haack et al., 2024). The digital component in the multicomponent program was implemented within the framework of the program. Results from the development phase, open-feasibility test as well as the school- and parent-group reports were available for the implementation of the program. However, the samples and designs of these reports were not equivalent to additional randomized trials (Chung et al., 2024; Haack et al., 2025; Pfiffner et al., 2023).

Flex is a digital tool for ADHD support co-designed with schools and families to ensure flexibility and use in everyday life (Russell, Holt, Wellaway, et al., 2026). A companion feasibility case series in eight schools involved 40 children, 53 teachers and 49 caregivers. Participants found the toolkit acceptable, but unguided school implementation did not achieve adequate fidelity; supported delivery was recommended (Russell, Holt, Kelman, et al., 2026). The study was not powered to establish effectiveness. These findings weaken any assumption that access to a digital toolkit alone is sufficient.

Small experimental or implementation reports examined remotely coached functional assessment, functional communication and school-team consultation (Craig et al., 2023; Inoue & Takagi, 2021; Singh et al., 2021). Other reports addressed field-tested behavioral programming, digital engagement, telementoring and anticipated use of a telepresence robot (Belisle et al., 2021; King et al., 2021; Zhang et al., 2023; Zoder-Martell et al., 2022). Note that the secondary individual-participant analysis of Coping Power included an internet-enhanced condition and teacher-rated crossover effects, but the majority of the pooled participants received the treatment that was not digital, so the pooled set of 11 trials cannot be interpreted as 11 digital trials (McDaniel et al., 2025). The reports reviewed here generally included small samples of somewhat selected populations using a variety of programs.

Shared Planning and Service Continuity

Portal studies addressed desired coordination rather than proven educational effects. Interviews with 32 multidisciplinary professionals in France identified potential functions for integrated pediatric rehabilitation, including shared goals and controlled information exchange (Kersalé et al., 2025). A companion study with 24 young people aged 11-23 emphasized autonomy, accessible feedback and control over sharing; verbal French eligibility and the mixed-age sample limit transfer to other communication needs (Kersalé et al., 2026). An Italian autism platform was evaluated mainly for adult-user usability, rather than child social or learning effectiveness (Vallefuoco et al., 2021).

Pandemic service reports described variable access and family-provider relationships across school and other settings (Allison & Levac, 2022; Merrick et al., 2024; Murphy et al., 2021). Practitioner reports from special education physiotherapy and UK speech-language services described adaptation and family engagement, while a South African report showed how school leadership, practitioner time and WhatsApp access shaped caregiver coaching (Harel et al., 2024; Patel et al., 2022; Viljoen et al., 2025). These findings describe implementation conditions and service experiences; they do not establish that a particular platform produces integrated care or improved attainment (Mosbah et al., 2026).

Funding and Competing Interests

Funding and competing-interest information was charted for every included report. Eleven reports had no funding statement located in the examined text, and 17 had no competing-interest statement located; these counts do not mean that no support or interests existed. Reported support included public research awards, university resources, private foundation support, commercial programme support and acknowledged infrastructure or author support. For example, the Langbecker evaluation acknowledged NHMRC and Shell QGC programme support, while one author in the Emmett trial disclosed payment for telehealth lectures. The workbook preserves these distinctions. Funding was not used to assign a risk-of-bias score.

DISCUSSION

The evidence map suggests that the useful unit for service design is the coordinated pathway: who identifies a need, who provides specialist input, who supports implementation, and how the result returns to the school and family. These common enabling elements were identified in the review (explicit roles, local facilitation, shared functional targets, communication, protected time of staff and feedback). However, they were not tested as potential mediators in the review and therefore should be treated as implementation propositions.

Completed referrals measure access to care. Changes in symptoms or functioning are clinical outcomes, while staff confidence and platform usability are implementation outcomes. Classroom participation,

inclusion, and sustained academic progress require separate measures. The available evidence was insufficient to establish sustained educational benefit or equivalence between delivery modes.

A Saudi application would require co-design with students, families, school personnel and relevant clinical teams. International findings do not establish the fit of staffing, referral pathways, language, communication formats, connectivity or family expectations in Saudi settings. Arabic-accessible resources and alternatives for students who use AAC, sign language or other communication supports should be designed and evaluated with intended users. Local clinical governance and data-processing arrangements should be established before service deployment. Table 2 sets out a proposed model; it is an evaluation framework, not an observed Saudi intervention.

Table 2 Proposed Components for Local Co-design and Testing in Saudi Arabia

Proposed component	Operational approach	Evaluation measure
Named coordination	A designated school coordinator tracks referrals and agreed actions; clinicians retain clinical responsibilities.	Referral completion, time to first response and unresolved actions.
Shared functional goals	Student and family priorities inform one or two classroom-relevant targets agreed with the clinical team.	Goal attainment and an independently rated participation measure.
Supported implementation	Train a local facilitator and provide scheduled clinician coaching, with protected staff time.	Fidelity, session completion, workload and reasons for discontinuation.
Accessible communication	Offer Arabic materials, appropriate communication supports and a feasible low-bandwidth or assisted option.	Successful access, user burden and participation by communication need and location.
Documented review	Use proportionate information sharing and scheduled review of access, clinical and educational outcomes.	Completeness of agreed follow-up, family experience and clinically relevant escalation.

Note. Proposed components for local co-design and testing in Saudi Arabia. Components are drawn from the map and have not been validated as a package.

An initial feasibility evaluation could follow one school term, with baseline and end-of-term measures and an intermediate implementation review. Its primary purpose should be recruitment, acceptability, accessibility, burden, delivery fidelity and outcome-data completeness. Progression criteria should be agreed before recruitment. A later comparative evaluation could test school-cluster allocation or another defensible design if allocation is impractical, with sample size based on a prespecified primary outcome, clustering, expected variation and attrition. Setup costs, staff time, family travel, service utilization and unintended burdens should be measured rather than presumed to improve. Educational outcomes should be assessed separately from clinician and parent satisfaction, preferably by assessors unaware of allocation when feasible.

LIMITATIONS

The map has substantial coverage and retrieval limitations. Only two databases and English-language reports were searched; targeted programme checking was not comprehensive citation searching. Sixty-five of 119 sought reports were not retrieved (54.6%), so eligibility and results for more than half of the sought corpus

remain unknown. Their identifiers and unsuccessful routes are retained in Supplementary File 1 to make the extent of retrieval bias assessable. The direction or magnitude of that bias cannot be estimated from accessible reports alone. Screening was performed by the researcher alone, without independent screening by a second reviewer. Data extraction was not independently duplicated. Repeated checks do not remove selection or interpretation error. The eligibility refinements were not prospectively registered. Exact normalized-title deduplication can miss nonidentical duplicate titles. Empirical secondary analyses and descriptive implementation reports provide different information from trials, and mixed-age or stakeholder samples do not support age-specific effects. Related programme reports were not pooled as independent observations.

No formal critical appraisal or certainty grading was performed. Selected samples, self-report, small single-case designs, historical comparisons and emergency pandemic service changes limit inference and transferability. Funding and competing-interest fields may be incomplete where statements were not located, and charting does not establish absence of bias. The review therefore supports a transparent descriptive map and a local evaluation agenda, rather than definitive clinical recommendations or a validated Saudi model.

CONCLUSION

Digital clinical and rehabilitation services can connect with school support through condition-specific referral, supported therapy, school-home behavioral care and shared planning. Evidence is stronger for particular access or condition-specific outcomes than for sustained educational benefit. A Saudi model should make coordination, accessibility, local facilitation and outcome review explicit, then evaluate them prospectively. The present 43-report map is constrained by incomplete retrieval, single-reviewer screening and nonduplicated data extraction; these constraints must accompany its interpretation.

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APPENDIX A REPRODUCIBLE SEARCH STRATEGIES

Search date: 28 October 2026. Europe PMC coverage: 1 January 2015 to 28 October 2026. ERIC coverage: publication years 2015-2026 with peerreviewed:T. Full API request URLs, UTC request timestamps and SHA-256 response hashes are provided in Supplementary File 1. Europe PMC uses its title/abstract field restriction; ERIC uses its indexed search fields. The queries were executed as shown below.

Europe PMC 211 records

FIRST_PDATE:[2015-01-01 TO 2026-10-28] AND (TITLE_ABS:telehealth OR TITLE_ABS:telemedicine OR TITLE_ABS:telepractice OR TITLE_ABS:telerehabilitation OR TITLE_ABS:teletherapy OR TITLE_ABS:videoconferenc* OR TITLE_ABS:"digital health") AND (TITLE_ABS:school* OR TITLE_ABS:teacher* OR TITLE_ABS:"special education" OR TITLE_ABS:"individualized education") AND (TITLE_ABS:disabilit* OR TITLE_ABS:autis* OR TITLE_ABS:"cerebral palsy" OR TITLE_ABS:"developmental delay" OR TITLE_ABS:speech OR TITLE_ABS:"language disorder" OR TITLE_ABS:ADHD OR TITLE_ABS:"communication disorder" OR TITLE_ABS:"hearing loss")

ERIC 527 records

(telehealth OR telemedicine OR telepractice OR telerehabilitation OR teletherapy OR "digital health" OR videoconferencing) AND (disabilities OR disability OR autism OR "special education" OR speech OR "occupational therapy") AND publicationdateyear:[2015 TO 2026] AND peerreviewed:T

Duplicate processing: decode HTML entities twice; remove markup; apply Unicode NFKD normalization and ASCII lowercasing; remove nonalphanumeric characters; compare exact normalized titles. Prefer a published journal record to a matching preprint and Europe PMC to an ERIC match. Total: 738 records, 37 duplicate links, 701 records retained for screening. The individual duplicate crosswalk is supplied with the audit.

APPENDIX B PRISMA-SCR REPORTING MAP

Items	Reporting location or status
1-2	Title and structured abstract.
3-4	Introduction: rationale and review questions.
5	Methods: no prospectively registered protocol was available.
6-8	Methods and Appendix A: eligibility, information sources, exact search strategies and limitations.
9-11	Methods and Supplementary File 1: screening and eligibility decisions by the researcher, charting fields and decision records.
12 and 16	Methods and Limitations: formal critical appraisal not undertaken.
13	Methods: narrative synthesis and outcome-domain definitions.
14	Results, Figure 1 and Supplementary File 1: flow, full-text exclusions and unretrieved reports.
15 and 17	Supplementary File 1: characteristics and report-level findings.

18-19	Results and Discussion: pathway synthesis and interpretation.
20-21	Limitations and Conclusion.
22	Declarations state that this review received no funding and that the authors declare no competing interests; study-level support is charted separately.

Supplementary File 1: Search and Evidence Audit. This reporting map identifies where information or an explicit limitation is reported; it does not certify independent review or methodological completeness.