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Integrating Artificial Intelligence for Academically Challenged Students Education and Health

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ABSTRACT

Students with Intellectual and Developmental Disabilities (ID/DD) often experience overlapping medical and cognitive challenges that affect their academic participation and social interaction. Frequent absences, delayed progress, and limited communication skills highlight the urgent need for an integrated support system. Despite advancements in educational technology, most digital learning tools remain limited in addressing the dual educational and healthcare needs of ID/DD students. **This study** aims to identify existing gaps and propose a systematic framework for integrating Artificial Intelligence (AI) into education and health systems to enhance personalized learning and well-being for students with ID/DD. The study emphasizes the importance of combining health data with instructional design to achieve inclusive and adaptive learning experiences. **A systematic literature review** was conducted across multiple databases, including IEEE Xplore, ERIC, ACM Digital Library, and NFER, covering studies published between 2020 and 2025. The review process followed the PRISMA guideline and applied strict inclusion and exclusion criteria to ensure the validity of selected studies. **The findings** reveal that AI has been used to support ID/DD learners in various contexts, but most implementations remain fragmented, lacking integration between educational and medical data. The proposed AI-based framework connects these domains through data-driven decision-making, adaptive feedback, and intelligent reasoning mechanisms. **This study** contributes to the development of a holistic AI-driven model that supports individualized learning and health monitoring in line with SDG 3 (Good Health and Well-Being) and SDG 4 (Quality Education). Strengthening collaboration among educators, caregivers, and healthcare professionals can create more inclusive and effective educational ecosystems for ID/DD students.

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1. INTRODUCTION

Developmental Disabilities (DD) refer to a group of conditions caused by physical, learning, linguistic, or behavioral impairments that affect approximately one in six children in the United States. These disabilities also encompass Intellectual Disabilities (ID). Individuals with ID/DD are characterized by an Intel-

ligence Quotient (IQ) of approximately 70 or below [1]. Hence, the abbreviation ID/DD is commonly used to refer to individuals who fall within this group. A variety of factors may contribute to the onset of intellectual or developmental disabilities, including chromosomal abnormalities, intrauterine events, birth injuries, exposure to toxic substances, and developmental disorders that occur during the prenatal or early postnatal stages. However, nearly half of all ID/DD cases remain unexplained. The severity of ID/DD can range from mild (IQ 50–69), moderate (IQ 34–40), severe (IQ 20–36), to profound (IQ below 20). Frequently, ID/DD is accompanied by related disorders such as Autism Spectrum Disorder (ASD), cerebral palsy, fetal alcohol syndrome, genetic syndromes such as Fragile X, kernicterus, Tourette's syndrome, muscular dystrophy, and other common health conditions [2].

Figure 1. Sustainable Development Goals

The Figure 1 shows the Sustainable Development Goals (SDGs) introduced by the United Nations, which serve as a global framework for promoting inclusive, equitable, and sustainable development. Among the seventeen goals, SDG 3 (Good Health and Well-Being) and SDG 4 (Quality Education) are particularly relevant to this study [3]. SDG 3 emphasizes the importance of ensuring healthy lives and promoting well-being for all individuals at every age, while SDG 4 focuses on providing inclusive and equitable quality education and lifelong learning opportunities. Together, these goals establish a strong foundation for addressing the needs of students with ID/DD, who often face overlapping challenges in health and education [4]. By integrating these goals, this research highlights how AI can bridge the gap between healthcare support and personalized learning systems to promote a more inclusive educational environment aligned with the principles of sustainable development.

These medical and cognitive conditions significantly impact all aspects of a child's life, especially within educational environments [5]. Children and adolescents with chronic developmental impairments often experience limitations in participating in daily school activities. Research shows that students with intellectual and developmental disabilities face more significant functional limitations compared to their typically developing peers. For instance, approximately 35% of 1,416 adolescents diagnosed with intellectual disabilities and congenital heart conditions were found to have difficulties with reasoning and problem-solving. These challenges often lead to reduced participation in extracurricular programs, higher absenteeism rates, and slower academic progress, thereby restricting opportunities to acquire essential life skills and independence [6].

Although various digital learning tools have emerged in recent years, AI-based personalization for ID/DD learners remains underexplored and insufficiently implemented. Current educational technologies rarely integrate individualized medical data or cognitive profiles to adaptively tailor instruction [7]. By aligning with SDG 4, this study advocates for the integration of AI as a means to promote inclusive, high-quality education that accommodates diverse learners through personalized learning paths. Furthermore, in accordance with SDG 3, AI-driven data integration can support early health interventions and adaptive learning systems that enhance well-being and cognitive development among ID/DD students [8]. These interdisciplinary efforts bridge educational and healthcare domains, aiming to create equitable opportunities and promote lifelong learning for individuals with intellectual and developmental disabilities.

2. LITERATURE REVIEW

This study also introduces the concept of a "virtual specialist" a system that delivers remote educational practices through the use of interconnected data servers. The utilization of such a design resembles a robotic-based approach rather than an advanced cognitive framework [9]. Ideally, artificial intelligence should be capable of making intelligent decisions by considering factors of optimality. This would allow algorithms to dynamically adjust educational and care settings according to the individual characteristics of each student, ensuring that both intervention and follow-up processes are personalized and effective. This study provides a distinctive contribution by formulating an interdisciplinary framework that connects educational and healthcare perspectives in addressing the challenges faced by students with ID/DD. Rather than merely summarizing existing approaches, it emphasizes how Artificial Intelligence can serve as a bridge for real-time data integration, enabling adaptive learning and personalized health monitoring within a single, cohesive analytical model [10].

The overall structure of this study begins with an overview of the key aspects of well-being and learning among students with intellectual and developmental disabilities (ID/DD), followed by an explanation of the analytical methods and techniques employed in the research [11]. The next part discusses the role of computational reasoning in daily learning processes and highlights the current applications of AI within the context of ID/DD education. The study then presents a proposed framework designed to bridge existing gaps by integrating diverse skills, methods, and instruments within a unified system [12]. Finally, this paper concludes with a summary of key findings and recommendations for future research.

As of May 2008, a total of 177 countries had ratified the Convention on the Rights of Persons with Disabilities (CRPD), which aims to protect the fundamental rights of individuals with disabilities, both adults and children [13]. In the educational context, it has been emphasized that teaching strategies should accommodate differences among learners. Therefore, various assessment tools have been developed to evaluate children's intelligence levels and adaptive abilities, including self-care, communication, and behavioral flexibility [14]. Individuals with intellectual or developmental disabilities generally achieve intelligence test scores about two standard deviations below the population average (an IQ of 70 or less) and exhibit significant limitations in adaptive functioning [15].

In addition to cognitive and functional limitations, health issues are prevalent among children and adolescents with intellectual or developmental disabilities. Studies indicate that the risk of birth-related neglect is 7.38 times higher in individuals with such conditions, while the likelihood of experiencing medical problems is approximately 2.5 times greater [16]. The frequent comorbidity of multiple disabilities and medical complications also contributes to higher school absenteeism rates. The necessity for comprehensive data becomes evident when an information gap is identified and must be addressed.

Table 1. Individuals with intellectual disabilities are generally characterized by distinctive cognitive and adaptive limitations

ID-type	**Physical characteristics**	**Adaptive / Socialization characteristics**	**Potential medical issues**
Unknown Cause	Often presents minor craniofacial variations or general health concerns	Mild challenges in social interaction and communication	General health issues (unidentified)
Autism Spectrum Disorder (ASD)	May show differences in stature or motor coordination	Significant difficulties in socialization, communication, and behavioral adaptation	Gastrointestinal disorders, developmental coordination issues, epilepsy, ADHD

The Table 1 shows the classification of individuals with intellectual disabilities based on their physical, adaptive, and medical characteristics. The data highlight that students with ID/DD exhibit a wide range of variations in physical appearance, cognitive ability, and social adaptability [17]. For instance, those with unknown causes of intellectual disability tend to show minor craniofacial or general health issues accompanied by mild challenges in communication and social interaction. In contrast, individuals diagnosed with Autism Spectrum Disorder (ASD) frequently display more distinct physical or motor characteristics and experience significant difficulties in socialization, communication, and behavioral regulation [18].

These variations emphasize the importance of understanding the multidimensional nature of intellectual and developmental disabilities [19]. By recognizing the interconnection between physical conditions,

adaptive functioning, and medical concerns, educators and healthcare professionals can design more effective intervention strategies. Furthermore, the diversity presented in the table underscores the need for AI-based systems capable of integrating these variables to support personalized learning and health management [20]. Such systems can adapt instructional and clinical decisions according to each student's unique needs, contributing to more inclusive and data-informed educational environments.

3. METHODOLOGY

This study aims to identify existing gaps in the literature regarding the application of AI in supporting learning for students with Intellectual and Developmental Disabilities (ID/DD) [21]. The research adopts a structured and systematic literature review approach to synthesize prior findings, evaluate methodological rigor, and identify emerging trends across the intersection of education, healthcare, and intelligent systems [22]. By combining perspectives from both educational and medical domains, this study seeks to provide a comprehensive understanding of how AI-based interventions can enhance learning outcomes, health management, and overall well-being for ID/DD learners. The review process was conducted following standardized guidelines to ensure transparency, reproducibility, and academic reliability. A series of procedures covering study identification, database selection, screening, eligibility verification, and inclusion were applied to capture high quality empirical evidence. Through this process, the study aims not only to map the current research landscape but also to establish a conceptual foundation for developing integrated AI based frameworks that connect personalized learning with health data analytics [23].

3.1. Planning the Review

In this phase, the review was carefully planned to ensure methodological rigor and comprehensive coverage of the topic. The process began by identifying primary studies relevant to the integration of AI in educational and healthcare settings for students with ID/DD [24]. This step included defining research objectives, outlining inclusion and exclusion criteria, and constructing search strings to capture studies addressing AI-driven personalization, learning analytics, and health data utilization. The review planning also considered the interdisciplinary nature of the research, emphasizing the connection between educational outcomes, cognitive development, and medical support systems [25].

To strengthen the validity and reliability of the findings, the review process incorporated a structured approach for identifying and selecting databases and resources [26]. Key academic repositories such as IEEE Xplore, ERIC, ACM Digital Library, and NFER were prioritized due to their relevance to technology, education, and policy research. Additional sources such as Scopus and Google Scholar were consulted to capture broader perspectives and gray literature [27]. This systematic planning ensured that the collected studies represented diverse yet complementary viewpoints, allowing the review to provide a holistic understanding of how AI contributes to inclusive learning and health enhancement among ID/DD students.

3.2. Databases and Online Timeframe

Since this review is inherently interdisciplinary, multiple perspectives were considered during the search process, including individuals with various types of ID/DD and their unique educational needs, health and educational interventions designed for intellectual or developmental disabilities, as well as the utilization of artificial intelligence within ID/DD student learning contexts. Peer-reviewed articles written in English were prioritized to ensure that the data analyzed in this study met recognized academic and methodological standards. The review focused on selecting high-quality studies that provided substantial evidence regarding the integration of AI into educational practices for students with Intellectual and Developmental Disabilities (ID/DD). The literature screening process emphasized credibility and relevance, drawing from internationally recognized databases such as IEEE Xplore, ACM Digital Library, ERIC, and NFER. These databases were selected to capture a wide spectrum of research from technically focused AI applications to educational studies addressing learning disabilities and cognitive support [28]. Additional searches through Scopus, Google Scholar, and EBSCO Education Source were also conducted to include supplementary references, ensuring that both empirical and conceptual works were represented in the dataset.

The deliberate inclusion of diverse databases reflects the interdisciplinary foundation of this research. While IEEE Xplore and ACM primarily provide technological and computational perspectives, ERIC and NFER offer valuable insights into pedagogy, behavioral development, and educational policy [29]. This balanced combination allows the study to integrate cognitive, clinical, and computational dimensions into a unified

analytical framework. The resulting literature corpus presents a holistic view of AI-assisted learning, encompassing not only the technical mechanisms behind intelligent systems but also the human and contextual factors influencing their adoption [30]. By drawing from multiple disciplines, this research provides a richer understanding of how AI-driven tools can enhance adaptive learning, promote inclusion, and improve health-related decision-making for ID/DD students.

Table 2. Initial Search Strings

Topic	Search terms
Artificial Intelligence	Advisory systems, artificial intelligence, machine intelligence, intelligent support, machine learning, expert system, neural network, natural language processing
Health informatics / Intellectual disabilities	Medical records, health information systems, health informatics, mental retardation, autism, ADHD, intellectual functioning, adaptive behaviors, IDD, IDEA, IFSP, IEP, developmental delay, cerebral palsy, epilepsy

The Table 2 shows the initial search strings used in this study to identify relevant literature on the intersection of AI and health informatics related to intellectual disabilities. It is divided into two main topics Artificial intelligence and Health informatics/Intellectual disabilities each accompanied by corresponding search terms [31]. The AI topic includes terms such as advisory systems, machine learning, neural network, and natural language processing, reflecting the technological focus. Meanwhile, the health informatics topic lists terms like medical records, autism, ADHD, intellectual functioning, and cerebral palsy, which relate to medical and cognitive aspects of individuals with intellectual and developmental disabilities [32]. Together, these search strings were designed to guide a comprehensive database search for studies integrating AI technologies within health and educational frameworks to support individuals with ID/DD [33].

3.3. Keyword Identification

The process of keyword identification was carried out carefully to ensure the precision and comprehensiveness of the literature search. The initial list of keywords was developed based on the authors' prior understanding and expertise in the relevant research fields, then refined through an extensive review of terminologies frequently used in related studies and authoritative publications [34]. This comprehensive list, as presented in Table 2, was designed to capture research that connects the application of artificial intelligence and health informatics within computer science with educational frameworks supporting students who have intellectual and developmental disabilities (ID/DD).

The finalized set of keywords was constructed to ensure that the search encompassed not only various aspects of artificial intelligence such as machine learning, adaptive systems, intelligent tutoring, neural networks, and natural language processing but also terminologies closely related to cognitive, behavioral, and developmental challenges, including intellectual disability, developmental delay, autism spectrum disorder, ADHD, and special needs education [35]. This inclusive structure of keywords was intentionally developed to bridge technological and educational perspectives, enabling a systematic exploration of the integration between AI-based systems and support mechanisms for learners with special needs.

These keywords served as the main foundation for conducting a structured and reproducible search across multiple academic databases such as IEEE Xplore, ACM Digital Library, ERIC, and Scopus. Through this methodical approach, the study ensured the inclusion of high-quality, peer-reviewed publications that contribute to a comprehensive understanding of how artificial intelligence can be effectively utilized to enhance educational and healthcare outcomes for students with intellectual and developmental disabilities [36].

3.4. Inclusion and Exclusion Criteria

The main objective of this review was not to conduct an exhaustive analysis of AI research in general, but rather to identify, evaluate, and synthesize scholarly works that specifically explore the application of AI reasoning within educational and healthcare contexts for students with intellectual and developmental disabilities (ID/DD). To ensure the quality, relevance, and methodological rigor of the reviewed studies, a structured set of inclusion and exclusion criteria was established. The inclusion criteria focused on peer-reviewed articles published in English between January 2020 and January 2025, emphasizing studies that examined AI

technologies in educational settings or health informatics related to students with intellectual or developmental disabilities. Priority was given to literature discussing adaptive learning systems, data-driven educational frameworks, and AI-based interventions that support special education and health integration [37].

In contrast, research that did not involve the application of AI, studies unrelated to intellectual or developmental disabilities, and publications outside the specified time range were excluded. Non-English sources and general education studies without a specific focus on special needs learners were also omitted. By applying these explicit criteria, the review ensured the inclusion of only relevant, high-quality, and methodologically sound research. This rigorous selection process strengthened the reliability of the analysis and provided a robust foundation for identifying knowledge gaps and proposing an integrated AI-based framework to enhance educational and healthcare outcomes for students with ID/DD.

3.5. Review Procedure and Data Collection

The systematic review process in this study was conducted through four sequential stages including, identification, screening, eligibility, and inclusion. All collected documents were systematically organized in a shared cloud repository to facilitate remote collaboration among reviewers and to prevent data duplication during the screening process. The review team consisted of domain experts in both intellectual and developmental disabilities as well as artificial intelligence systems, who independently analyzed and summarized each selected publication according to their respective areas of expertise. This collaborative and structured approach ensured a balanced assessment of methodological quality and thematic relevance across the reviewed literature.

From the seven academic databases searched, a total of 1,550 articles were initially identified. Following the first screening, 615 studies were retained for further evaluation, while duplicate entries were removed, resulting in 935 unique records. Each article then underwent a comprehensive review process, including title, abstract, and full-text screening, leading to the exclusion of 796 papers based on predefined criteria. An additional 34 papers were excluded due to redundancy or lack of relevance, leaving 105 high-quality studies for final inclusion. To capture the most recent advancements in AI, five supplementary grey literature sources from reputable institutions such as Microsoft, Woodbine House, and the New Media Consortium were also incorporated. This rigorous and transparent selection process ensured that the final dataset provided a robust, current, and comprehensive foundation for analyzing the intersection of AI applications, health informatics, and educational support for students with intellectual and developmental disabilities.

3.6. Study Reliability

To ensure reliability and internal validity, all coding decisions and extracted data were cross-checked by multiple reviewers. Inter-Rater Reliability (IRR) testing was performed during the screening verification phase to confirm consistency in inclusion and exclusion decisions. Discrepancies were discussed until consensus was reached, ensuring a robust and transparent review process.

Table 3. Inclusion and Exclusion Criteria

Inclusion criteria	**Exclusion criteria**
Published online January 2020–January 2025	Published before 2025
Published in English	Not in English language
Education for special needs	Education for non-special needs students
Artificial intelligence use in education for students with intellectual disability	Not an artificial intelligence study or not related to learning context

The Table 3 shows the inclusion and exclusion criteria applied during the article selection process to ensure the relevance, quality, and methodological consistency of the reviewed studies. The inclusion criteria focused on peer reviewed publications written in English and published between January 2020 and January 2025, emphasizing studies related to artificial intelligence applications in educational settings for students with special needs or intellectual disabilities. In contrast, the exclusion criteria eliminated studies published before 2020, written in languages other than English, unrelated to special education, or not involving AI in learning contexts. These criteria were established to refine the dataset, ensuring that only credible and contextually relevant literature was included in the final review for a more accurate and meaningful analysis.

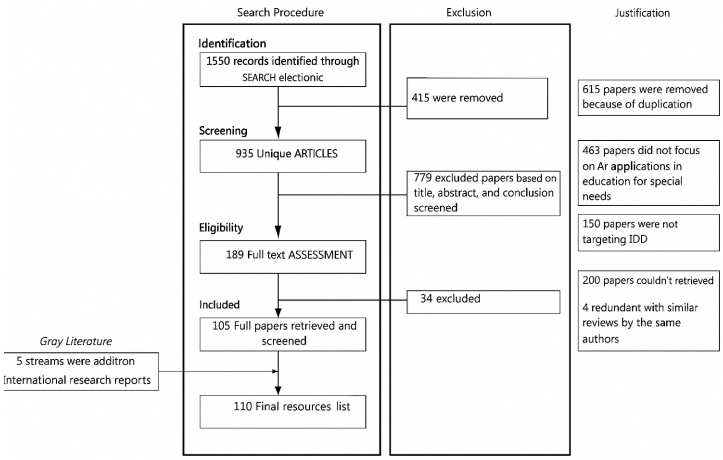

Figure 2. Search and Selection Process Flowchart

The Figure 2 shows the search and selection process flowchart used in this systematic review, outlining the stages of identification, screening, eligibility, and inclusion of research papers. The diagram illustrates how 1,550 initial records were identified through electronic searches, reduced to 935 unique articles after removing duplicates, and then narrowed down to 189 papers for full-text assessment. Following detailed evaluation, 105 papers were included in the final analysis, with an additional five grey literature sources incorporated from international research reports to enrich the findings. The flowchart visually represents the rigorous filtering process and justifications for exclusion, ensuring that only relevant, high-quality, and methodologically sound studies were included in the final review dataset.

4. RESULT AND DISCUSSION

AI has been increasingly utilized to assist individuals with Intellectual and Developmental Disabilities (ID/DD) in several key areas, including educational training through interactive games, enhanced risk assessment tools, and the provision of engaging and adaptive learning experiences. However, the findings of this literature review indicate that such efforts are dispersed across various sources and lack a unified framework or consensus. Figure 2 illustrates the domains of AI applications that support individuals with ID/DD, highlighting the ongoing need for greater data flow, system integration, and connectivity among technologies and frameworks currently in use.

Despite promising advancements, the application of AI to support holistic cooperation and inclusion for people with ID/DD remains underdeveloped. The goal of this study is to propose methods that integrate existing frameworks with AI-driven reasoning components. Rather than focusing on prediction or diagnostic modeling, this approach seeks to unify diverse data sources including information on health, behavioral tendencies, available resources, and historical records within educational and healthcare contexts. By leveraging such data, this study proposes the development of an AI-based instructional guidance system that can adapt to individual learning and health needs, thereby enhancing user satisfaction and promoting better learning outcomes.

Several general strategies for integrating existing frameworks, technologies, and tools are proposed. Thanks to the adaptive nature of AI, the proposed design framework emphasizes the use of personalized health data to improve individual learning experiences. The incorporation of AI reasoning capabilities into this system can facilitate greater autonomy among students by bridging the gap between their needs and available educational or health services. Moreover, AI reasoning mechanisms play a critical role in connecting personalized health analytics with adaptive learning design. For example, reinforcement learning algorithms can continuously refine individualized feedback loops, while predictive analytics track cognitive and physiological indicators to recommend interventions dynamically. Such adaptive feedback mechanisms allow real-time personalization, ensuring that each learner's academic plan evolves alongside their health and cognitive progress. The proposed framework (illustrated in Figure 3) envisions a comprehensive structure that combines intelligent

modules and supportive emotional networks, ensuring that educational and wellness goals for individuals with ID/DD are addressed holistically.

The intelligent components of this proposed system include an AI-based educational guidance module, which acts as the foundation for the overall architecture. This module would serve as a personalized learning tool, helping students with ID/DD plan and manage their educational paths according to their specific health data and developmental needs. Integrating these elements with an existing School Counseling Framework will create synergy and improved efficiency compared to using the components in isolation. In practice, no single module can operate independently removing or excluding any element would diminish the overall productivity and functionality of the proposed system.

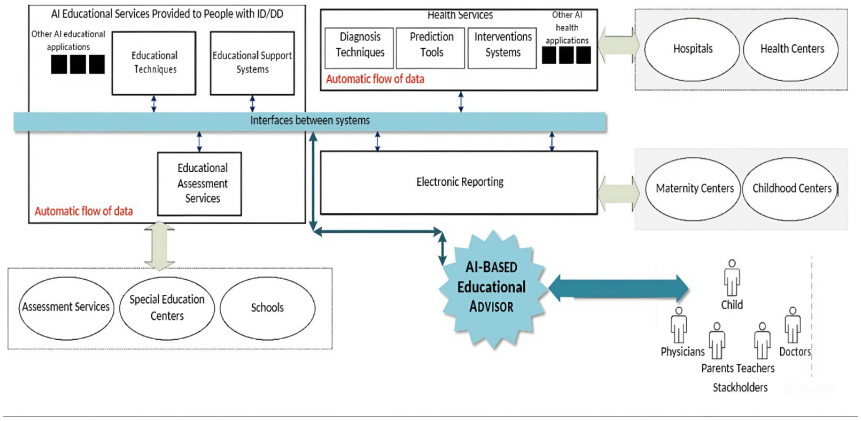

Figure 3. Proposed architecture integrating the capabilities of various existing systems, techniques, and tools

The Figure 3 shows the proposed AI-based educational architecture that integrates multiple existing systems, techniques, and tools to support learners with Intellectual and Developmental Disabilities (ID/DD). This framework connects educational, medical, and administrative systems through automated data exchange to create a holistic, adaptive learning environment. The architecture consists of several intelligent modules, including the Comprehensive Clinical History Module, which compiles health data from various medical sources to build personalized health profiles, and the School Proposal Section, which uses AI algorithms to design and continuously update individualized learning plans based on each student's health and academic data. Additionally, the AI-Based Education Advisor serves as the central component, assisting educators and counselors in making data-driven decisions by synthesizing educational and health information. Through continuous data collection and feedback loops, the system evolves to provide more precise and responsive learning recommendations. Overall, this framework demonstrates how AI can bridge the gap between health and education systems, enabling personalized instruction, improving efficiency, and fostering inclusive learning experiences for students with ID/DD.

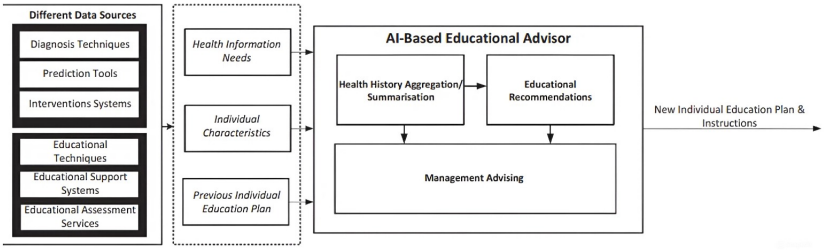

Figure 4. Proposed AI-Based Component Design

The Figure 4 shows the proposed AI-Based Component Design, which illustrates how artificial intelligence integrates data from multiple educational and healthcare sources to generate personalized learning

plans for students with Intellectual and Developmental Disabilities (ID/DD). The system collects inputs such as diagnostic techniques, prediction tools, intervention systems, and previous education plans, then processes them through the AI-Based Educational Advisor. This advisor performs three main functions health history aggregation and summarization, educational recommendations, and management advising to produce a new, individualized education plan tailored to each learner's unique health and cognitive characteristics. The figure highlights how AI enables a data-driven and adaptive approach to educational planning, ensuring that instructional strategies are continuously refined to meet the evolving needs of students with ID/DD.

5. MANAGERIAL IMPLICATION

The findings of this study highlight that educational institutions need to adopt more proactive managerial strategies in implementing AI-based learning systems for students with Intellectual and Developmental Disabilities (ID/DD). School administrators and policymakers should prioritize the integration of adaptive technologies that align with each student's unique health and cognitive profiles. This requires a shift from standardized learning management systems toward personalized, data-driven educational models. By doing so, institutions can not only enhance learning outcomes but also fulfill the goals of inclusive education as outlined in the Sustainable Development Goals (SDG 4 – Quality Education).

From a managerial standpoint, the implementation of AI-driven frameworks demands the establishment of a robust data management ecosystem that connects educational and healthcare data securely. Effective coordination between IT managers, health professionals, and educators is essential to ensure that data privacy, ethical considerations, and interoperability standards are maintained. The development of cross-functional data integration protocols will enable real-time insights into students' academic progress and health conditions, thereby supporting informed decision-making. This integrated approach ensures that resource allocation, intervention planning, and performance evaluations are grounded in comprehensive, evidence-based analytics.

Finally, this study underscores the importance of intersectoral collaboration as a strategic managerial initiative. Universities, healthcare organizations, and government agencies must work collectively to design sustainable policies and frameworks that leverage AI for inclusive education and health monitoring. Managers should also invest in continuous professional development to enhance educators' digital literacy and readiness to apply AI-based tools effectively. Such managerial efforts not only strengthen institutional capacity but also contribute to broader societal goals by fostering inclusivity, innovation, and well-being for students with intellectual and developmental disabilities.

6. CONCLUSION

The findings of this study reveal that instructional strategies for students with Intellectual and Developmental Disabilities (ID/DD) require a comprehensive integration of educational and healthcare data within AI-based learning systems. The systematic literature review conducted from 2020 to 2025 highlights that, although AI has been increasingly adopted to address learning challenges for individuals with diverse cognitive abilities, most existing approaches remain fragmented and lack health- related personalization. The results emphasize that effective educational improvement for ID/DD students can only be achieved when cognitive, medical, and behavioral data are combined into a single adaptive decision support framework. This integrated approach supports the development of inclusive, evidence-based learning environments that can dynamically respond to each student's developmental trajectory.

The novelty of this study lies in the formulation of a cross-domain AI framework that unites educational and healthcare perspectives through intelligent data reasoning and adaptive learning processes. Unlike prior reviews that discuss educational technologies in isolation, this study proposes a unified model capable of maintaining personalized health records, generating real-time learning recommendations, and guiding both teachers and caregivers in decision-making. By emphasizing interdisciplinary data flow, the proposed architecture introduces a new paradigm in inclusive education one that aligns with the principles of Sustainable Development Goal (SDG) 3 Good Health and Well-Being and SDG 4 Quality Education. This synthesis contributes not only to theoretical advancements in AI-assisted pedagogy but also to the practical enhancement of support systems for students with ID/DD.

Future research should expand upon this framework by conducting empirical testing and system validation in real educational settings. Further studies may explore how machine learning, natural language processing, and predictive analytics can enhance the precision of adaptive feedback loops in monitoring both

cognitive and emotional development. Moreover, longitudinal studies that assess the long-term impact of AI-driven personalization on student independence, teacher workload, and institutional policy are essential for ensuring sustainable implementation. Strengthening interdisciplinary collaboration between educators, health experts, and AI developers will also be crucial for refining this model into a scalable, ethically responsible system that continues to evolve alongside emerging educational technologies.

7. DECLARATIONS

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7.2. Author Contributions

Conceptualization: ES; Methodology: EA; Software: RN; Validation: ES and DJ; Formal Analysis: EA and DJ; Investigation: RN; Resources: ES; Data Curation: EA; Writing Original Draft Preparation: GP and RN; Writing Review and Editing: GP and EA; Visualization: RN and ES; All authors, ES, EA, DJ, RN, and GP, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

All datasets generated or utilized in this study can be accessed by contacting the corresponding author, provided that a reasonable request is submitted.

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7.5. Declaration of Conflicting Interest

The authors affirm that they have no financial or personal conflicts of interest that could have affected the conduct of the study, the interpretation of the findings, or the writing of this manuscript.

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