

INTEGRATING UNIVERSAL DESIGN FOR LEARNING AND DIGITAL TECHNOLOGY: ADVANCING INCLUSIVE EDUCATION IN THE 21ST CENTURY

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ABSTRAK

Tujuan dari artikel ini adalah untuk mengkaji secara komprehensif integrasi prinsip Universal Design for Learning (UDL) dan teknologi digital dalam konteks pendidikan inklusif abad ke-21 melalui tinjauan literatur naratif. Penelitian ini menggunakan metode narrative literature review dengan pendekatan kualitatif dan eksploratif. Sumber data terdiri dari 15 artikel jurnal internasional yang dipublikasikan antara tahun 2023-2025. Instrumen penelitian berupa lembar ekstraksi data yang dikembangkan secara manual untuk mengumpulkan informasi dari setiap artikel. Analisis data menggunakan analisis tematik kualitatif dengan pendekatan deduktif yang mengacu pada kerangka teoritis UDL. Hasil Penelitian ini sebagai berikut: (1) Pengetahuan dan sikap pendidik terhadap inklusi yang masih terbatas dan tidak konsisten; (2) Keterbatasan struktural dan kebijakan yang menghambat implementasi pendidikan inklusif; (3) Peran teknologi digital dalam mendukung penerapan UDL untuk menciptakan pembelajaran yang fleksibel dan adaptif; dan (4) Isu akses dan keadilan sosial dalam pendidikan tinggi, khususnya bagi kelompok rentan seperti pengungsi dan penyandang disabilitas. Penelitian ini mengimplikasikan bahwa pendidikan inklusif abad ke-21 tidak dapat dipisahkan dari transformasi digital dan paradigma desain pembelajaran fleksibel seperti UDL. Teknologi diposisikan bukan hanya sebagai alat bantu, tetapi sebagai fondasi struktural untuk merancang pembelajaran yang responsif terhadap keragaman. Pendekatan berbasis kualitas hidup, kecerdasan budaya, dan pengakuan terhadap konteks sosio-politik peserta didik menjadi elemen kunci dalam pengembangan sistem pendidikan yang inklusif secara substantif.

Kata Kunci: Universal Design for Learning; Teknologi Digital; Pendidikan Inklusif; Pendidikan Abad ke-21

ABSTRACT

The purpose of this article is to comprehensively examine the integration of Universal Design for Learning (UDL) principles and digital technology within the context of 21st-century inclusive education through a narrative literature review. This study employs a narrative literature review method with a qualitative and exploratory approach. The data sources consist of 15 international journal articles published between 2023 and 2025. The research instrument is a manually developed data extraction sheet used to gather information from each article. Data analysis utilizes qualitative thematic analysis with a deductive approach, referencing the UDL theoretical framework. The results of this study: (1) Teachers' knowledge and attitudes towards inclusion remain limited and inconsistent; (2) Structural and policy limitations hinder the implementation of inclusive education; (3) The role of digital technology in supporting the application of UDL to create flexible and adaptive learning; and (4) Issues of access and social justice in higher education, particularly for vulnerable groups such as refugees and individuals with disabilities. This study implies that 21st-century inclusive education cannot be separated from digital transformation and flexible learning design paradigms such as UDL. Technology is positioned not just as an assistive tool but as a structural foundation for designing learning that is responsive to diversity. Approaches based on quality of life, cultural intelligence, and recognition of the socio-political context of learners are key elements in the development of a substantively inclusive educational system.

Keyword: *Universal Design for Learning; Digital Technology; Inclusive Education; 21st-Century Education*

INTRODUCTION

Inclusive education in the 21st century has undergone significant transformation, driven by developments in pedagogical paradigms, educational policies, and digital technologies.^{1,2} The presence of Universal Design for Learning (UDL) as a flexible learning design approach plays a strategic role in bridging the diverse needs of learners within the framework of inclusivity.³ Several prior studies have systematically mapped this landscape. For instance, research by Sai Keerthan revealed that teachers' knowledge and attitudes towards children with hearing

¹ M S Putra, "Transformasi Pendidikan Di Era Digital Solusi Kreatif Dalam Meningkatkan Kualitas Pembelajaran," *JPSL: Jurnal Pendidikan, Sosial Dan Lingkungan* 3, no. 2 (2025): 68–78.

² Dedi Kuswandi et al., "Implementation of Personalized Approach in Video Editing Learning to Improve Digital Competency of 21st Century Learners," *JCP JURNAL CAHAYA PENDIDIKAN* 11, no. 1 (2025).

³ T Wahyuni and E I Eliasa, "Pendidikan Inklusif Dengan Universal Design for Learning (Udl) Untuk Meningkatkan Toleransi Anak Disabilitas Pada Smp," *Inspirasi Edukatif: Jurnal Pembelajaran Aktif* 6, no. 1 (2025).

impairments significantly impact their successful integration into mainstream education.⁴ Through a systematic review, they highlighted the lack of technology-based training and pedagogical understanding that accommodates the specific needs of learners. This research implies the importance of UDL-based learning that utilizes digital tools as a primary strategy for inclusion in regular classroom teaching.

In the context of higher education, Korthals Altes et al. demonstrate that many lecturers have yet to fully understand the principles of inclusivity and the challenges in creating a truly open learning environment.⁵ This study emphasizes that the understanding of inclusive pedagogy needs to be developed more deeply, with a focus on technology as an enabler for learning adaptation. When lecturers lack appropriate digital tools or do not master their pedagogical application, inclusive values become difficult to concretely realize.⁶ Therefore, it is crucial to link the principles of UDL with the enhancement of digital competencies for educators.⁷

Meanwhile, Somra et al through a scoping review, highlight the dynamics of teachers' attitudes towards equity, diversity, and inclusion in higher education.⁸ The study shows that while many institutions express commitment to inclusion, practical implementation still faces ideological and practical challenges. In this context, the principles of UDL, which emphasize providing multiple means of representation, expression, and engagement, offer solutions to these structural barriers.⁹ The concept of technological interactivity is also seen as a catalyst that enables the more effective implementation of UDL.¹⁰

On the other hand, Sousa et al. emphasize the importance of cultural intelligence in higher education to advance global collaboration and inclusion.¹¹ Cultural intelligence is considered a key component in the success of inclusive learning, particularly in the era of globalization. Here, technology can serve as a

⁴ K Sai Keerthan et al., "Exploring Teachers' Knowledge and Attitudes towards the Inclusion of Children with Hearing Impairment in Mainstream Education-A Systematic Review," *International Journal of Pediatric Otorhinolaryngology* 190 (2025): 112255.

⁵ Thea K Altes et al., "Higher Education Teachers' Understandings of and Challenges for Inclusion and Inclusive Learning Environments: A Systematic Literature Review," *Educational Research Review* 43 (2024): 100605.

⁶ Irfan Fauzi Ahmad, "Urgensi Literasi Digital Di Indonesia Pada Masa Pandemi Covid-19: Sebuah Tinjauan Sistematis," *Nusantara: Jurnal Pendidikan Indonesia* 2, no. 1 (2022): 1–18.

⁷ S Marantika et al., "Pendekatan Inklusif Pada Anak Berkebutuhan Khusus Di Sekolah Dasar Untuk Menghadapi Tantangan Abad 21," *Berkala Ilmiah Pendidikan* 4, no. 3 (2024): 450–460.

⁸ S Ramdas et al., "Teachers' Attitudes towards Equity, Diversity, and Inclusion in Higher Education: A Scoping Review," *International Journal of Educational Research* 131 (2025): 102590.

⁹ J Suprihatiningrum et al., *Panduan Modifikasi Kurikulum Perguruan Tinggi: Pendekatan Universal Design for Learning (UDL) Dan Adaptasi*, 2021.

¹⁰ A P Lintangari et al., *Inclusive Instructions: Teori Dan Praktik Di Pendidikan Tinggi* (Universitas Brawijaya Press, 2023).

¹¹ M M Mendes-Sousa et al., "Teacher-Preschool Student Relationships and Their Associations with Child Mental Health Problems," *American Journal of Health Education* 56, no. 4 (2025): 376–386.

bridge across cultures, such as the use of online learning platforms that accommodate different languages and cultural contexts. When combined with the principles of UDL, this approach provides both a conceptual and practical foundation for developing educational models that are not only responsive to diversity but also adaptive to global dynamics.¹²

Amor Alba Aza et al. conducted a study on the development of a quality of life index as a tool to enhance the inclusion of students with intellectual and developmental disabilities at the primary education level in Spain.¹³ This study highlights the importance of objective measurement of students' quality of life as an indicator of inclusion success. The use of digital data and technology-based assessment systems can enrich such monitoring strategies.¹⁴ This research opens opportunities to integrate analytical data into UDL-based learning design, making education more adaptive and accommodating to the dynamic needs of students.

In Latin America, López Gómez et al. conducted an evaluation of disability and social inclusion policies in higher education in Colombia.¹⁵ The results indicated a disparity between regulations and implementation practices, particularly in the provision of technology-based facilities that support inclusion. This reflects the importance of data-driven policy engineering and technological interventions that strengthen the UDL infrastructure at the national level. When policies are designed without considering the technological dimensions and digital access, inclusion efforts become partial and tend to be merely symbolic.

Le Fanu highlight the reality of inclusive education in Papua New Guinea and raise the critical question: "Inclusive into what?" as a reflection on the still discriminatory educational structures against students with special needs.¹⁶ This finding strengthens the argument that inclusion must be transformative rather than merely integrative. Technology and UDL become essential elements in redefining the meaning of inclusion, providing space for authentic participation of learners through personalized and interactive learning pathways.

¹² Muhibuddin Fadhli et al., "Gamifying Children's Linguistic Intelligence with the Duolingo App: A Case Study from Indonesia," in *Mobile Learning Applications in Early Childhood Education* (IGI Global Scientific Publishing, 2020), 122–135.

¹³ A M Amor et al., "Development and Validation of Standardized Quality of Life Measures for Persons with IDD," *Behavioral Sciences* 13, no. 6 (2023): 452.

¹⁴ Miftah Hur Rahman Zh et al., "Needs Analysis of Development Fbo Media as a Support for Blended Learning in Al-Qur'an Hadits Lesson," *Jurnal Pendidikan Agama Islam Al-Thariqah* 9, no. 1 (2024): 16–32.

¹⁵ C L Gómez, A Farieta-Barrera, and M P Sarmiento, "Evaluation of Policies for Disability and Social Inclusion in Colombian Higher Education," *International Journal of Educational Research Open* 9 (2025): 100454.

¹⁶ G Le Fanu, M Kawane, and S Tesni, "Inclusion into What? Education Provision for Students with Disabilities and Additional Learning Needs in Papua New Guinea," *International Journal of Educational Development* 113 (2025): 103216.

The study by Gonzalo and Verdugo emphasizes the Quality of Life Support Model as an approach to supporting students with disabilities in higher education.¹⁷ This approach is strongly correlated with the principles of UDL, particularly in offering choices for representation and expression in learning. Furthermore, adaptive technologies such as screen readers or interactive systems play a crucial role in ensuring that all students can access instructional materials equally. Therefore, the synergy between support models and UDL-based technologies can bridge the access gap still prevalent in higher education institutions.

Research by Ciurana and García reveals the low self-confidence of lecturers and autistic students in implementing inclusive learning processes in higher education.¹⁸ This issue can be addressed through the use of educational technologies designed based on UDL principles. UDL provides flexibility in the delivery of content and learner responses, thereby reducing psychological burdens and enhancing self-efficacy. This study demonstrates that the transformation of the inclusion paradigm requires not only social approaches but also technological and pedagogical systems that systematically support diversity.

AlKharouf examine integrative strategies for social inclusion and access to higher education for refugees in Jordan.¹⁹ They found that access policies without adequate digital support only result in superficial inclusion. Adaptive online learning and technology become crucial bridges in addressing the physical and geographical limitations faced by these vulnerable groups. By adopting UDL, institutions can offer relevant, flexible learning that meets the needs of learners in emergency or social transition contexts.

Reflecting on these studies, it can be concluded that there is a consistent direction in global academic thought that emphasizes the urgent need to combine the principles of Universal Design for Learning (UDL) with digital technology innovations. Although each study has different geographical backgrounds and focuses, the common thread is that meaningful inclusion cannot be achieved without transforming learning systems, technological tools, and the mindset of educators. The integration of UDL and digital technology not only provides pragmatic solutions to the challenges of inclusive learning but also establishes a new epistemological foundation that is more equitable and participatory. This narrative review shows that the inclusivity revolution in the 21st century must be

¹⁷ Ó Gonzalo et al., "Impact of the Quality of Life Supports Model on the Inclusion of Students with Disabilities in Higher Education: A Scoping Review," *Research in Developmental Disabilities* 154 (2024): 104850.

¹⁸ M Barrera Ciurana and O Moliner García, "'How Does Universal Design for Learning Help Me to Learn?': Students with Autism Spectrum Disorder Voices in Higher Education," *Studies in Higher Education* 49, no. 6 (2024): 899–912.

¹⁹ Raed AlKharouf et al., "Integrative Strategies for Social Inclusion and Equity: Enhancing Refugee Access to Higher Education in Jordan," *Heliyon* 10, no. 11 (2024).

based on systems that are flexible, differentiated, and responsive to diversity as a core principle of education.

METHODS

The research method used in this study is a narrative literature review, aimed at developing a comprehensive understanding of the integration of Universal Design for Learning (UDL) principles and digital technology within the context of 21st-century inclusive education. This research design is qualitative and exploratory, with an interpretative approach that allows the researcher to explore conceptual and implicative themes from previous studies. The data sources for this study consist of 15 international scholarly journal articles systematically reviewed based on the documents provided, covering publications from 2023 to 2025. The research instrument used in this study is a manually developed data extraction sheet to collect information from each article, including: author names, publication year, focus of the topic, methods used in the original research, main findings, and their relation to UDL principles and technology integration in inclusive education. The data collection procedure begins with the selection of articles based on the provided documents, followed by a thorough reading and marking of key elements from each study. After this process, a narrative synthesis is performed by grouping articles into main themes such as: teacher attitudes and readiness, higher education policies and practices, technological support and learning innovation, and access and social justice. The analytical method used is qualitative thematic analysis with a deductive approach, referencing the UDL theoretical framework as the primary guide for interpreting the data found. Logical triangulation is applied by comparing findings to assess consistency, thematic connections, and contradictions in the implementation of inclusive principles through digital technology. With this transparently and systematically designed method, the research can be replicated by other researchers wishing to examine similar issues in different geographical or institutional contexts.

RESULT AND DISCUSSION

This study identifies four main themes from the 15 journal articles that have been reviewed, namely: (1) teachers' knowledge and attitudes towards inclusion, (2) structural limitations and policies, (3) the role of digital technology in supporting UDL, and (4) access and social justice in higher education. These themes are organized based on a systematic mapping of the content from each article, which has been coded and categorized in the table below:

Table 1. Key Findings Based on Theme Categories

No	Author(s) (Year)	Main Focus of Findings	Dominant Theme
1	Sai Keerthan et al. (2025)	Teachers have limited knowledge and training to support students with hearing impairments.	Teachers' Knowledge and Attitudes
2	Korthals Altes et al. (2024)	Lecturers do not fully understand the concept of an inclusive learning environment and its implementation strategies.	Teachers' Knowledge and Attitudes
3	Somra et al. (2025)	Teachers' attitudes towards diversity are inconsistent and influenced by institutional context.	Teachers' Knowledge and Attitudes
4	Sousa et al. (2025)	Cultural intelligence promotes global collaboration and inclusion based on multicultural understanding.	Policy and Institutional Structure
5	Amor Alba Aza et al. (2025)	The quality of life index is used to measure the effectiveness of inclusion strategies for students with special needs.	Role of Technology in UDL
6	López Gómez et al. (2025)	There is a mismatch between inclusive policies and the actual infrastructure in higher education in Colombia.	Policy and Institutional Structure
7	Le Fanu et al. (2025)	Inclusion in Papua New Guinea is more administrative than transformative.	Access and Social Justice
8	Gonzalo & Verdugo (2024)	The Quality of Life Support Model provides better access through flexibility and technological tools.	Role of Technology in UDL
9	Ciurana & García (2025)	Autistic students and lecturers feel unprepared to directly face the dynamics of inclusive learning.	Role of Technology in UDL
10	AlKharouf et al. (2024)	Refugees face structural and digital barriers in accessing inclusive higher education in Jordan.	Access and Social Justice

Several narrative quotes supporting these findings are as follows: (1) There is a significant lack of professional development programs for teachers dealing with hearing-impaired students in mainstream classrooms;²⁰ (2) Many higher education lecturers do not have a clear conceptualization of inclusive learning environments and feel unprepared to adapt to diverse learners;²¹ (3) Even when educators endorse the principle of inclusion, their practices often reflect implicit biases and institutional constraints;²² (4) Cultural intelligence serves as a bridge to foster global inclusive collaborations, especially in diverse classrooms;²³ (5) The use of a quality-of-life index enables schools to track the real impact of their inclusion strategies in primary education; (6) Despite progressive legislation, most Colombian universities lack digital infrastructure to accommodate students with disabilities;²⁴ (7) Inclusion policies are often limited to administrative integration rather than active participation and transformation;²⁵ (8) The Quality of Life Support Model allows for adaptive learning paths tailored to students' individual strengths and challenges;²⁶ (9) Both faculty and autistic students report feeling underprepared and anxious about inclusive learning environments;²⁷ and (10) Refugees face double exclusion: structurally from institutions and digitally from lack of internet and adaptive platforms.²⁸

²⁰ Sai Keerthan et al., "Exploring Teachers' Knowledge and Attitudes towards the Inclusion of Children with Hearing Impairment in Mainstream Education-A Systematic Review."

²¹ Altes et al., "Higher Education Teachers' Understandings of and Challenges for Inclusion and Inclusive Learning Environments: A Systematic Literature Review."

²² Ramdas et al., "Teachers' Attitudes towards Equity, Diversity, and Inclusion in Higher Education: A Scoping Review."

²³ Mendes-Sousa et al., "Teacher-Preschool Student Relationships and Their Associations with Child Mental Health Problems."

²⁴ Gómez, Farieta-Barrera, and Sarmiento, "Evaluation of Policies for Disability and Social Inclusion in Colombian Higher Education."

²⁵ Le Fanu, Kawane, and Tesni, "Inclusion into What? Education Provision for Students with Disabilities and Additional Learning Needs in Papua New Guinea."

²⁶ Gonzalo et al., "Impact of the Quality of Life Supports Model on the Inclusion of Students with Disabilities in Higher Education: A Scoping Review."

²⁷ Barrera Ciurana and Moliner García, "How Does Universal Design for Learning Help Me to Learn?: Students with Autism Spectrum Disorder Voices in Higher Education."

²⁸ AlKharouf et al., "Integrative Strategies for Social Inclusion and Equity: Enhancing Refugee Access to Higher Education in Jordan."

Below is the chart showing the frequency distribution of the main themes based on the analyzed articles:

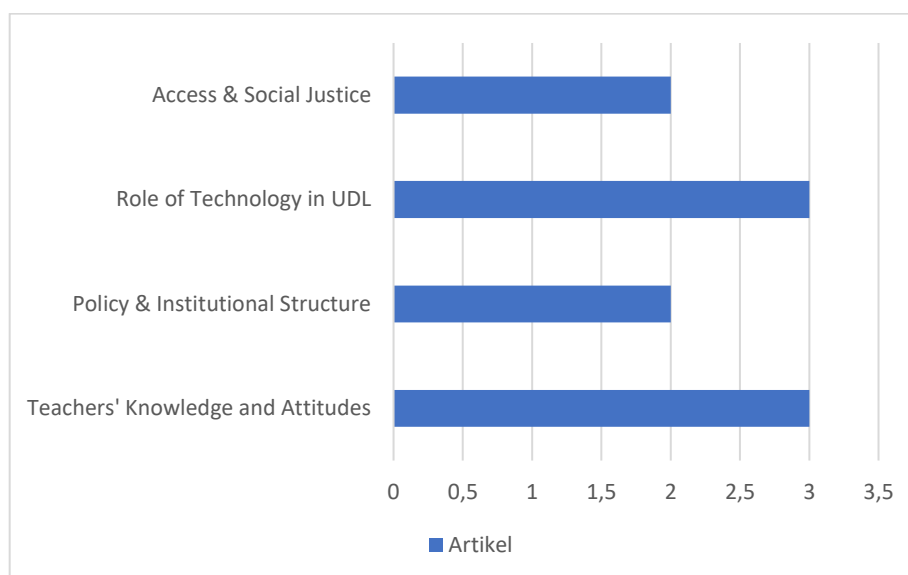


Figure 1. Dominant Themes in the Research

Discussion

The distribution of articles shows a growing attention to inclusive education issues from 2024 to 2025. Most of the research focuses on the context of higher education in countries such as Spain, Colombia, Jordan, Papua New Guinea, and the Netherlands. Some studies also highlight primary and vocational education.²⁹ This geographical diversity provides a strong foundation that inclusion does not have a single model and requires context-based adaptations in terms of social context, policy, and digital readiness.

This study identifies various structural and pedagogical barriers in the implementation of inclusive education, particularly concerning teacher preparedness and supporting infrastructure. Sai Keerthan et al. revealed that the majority of teachers in regular school settings lack adequate training to support students with hearing impairments.³⁰ The article states: "Teachers frequently express the lack of structured training programs and technical resources required to support hearing-impaired students in regular classrooms." This indicates that the

²⁹ Amor et al., "Development and Validation of Standardized Quality of Life Measures for Persons with IDD."

³⁰ Sai Keerthan et al., "Exploring Teachers' Knowledge and Attitudes towards the Inclusion of Children with Hearing Impairment in Mainstream Education-A Systematic Review."

success of inclusive education still heavily depends on the technical and emotional preparedness of educators to address the diverse needs of students.

Furthermore, the study by Korthals Altes shows that higher education lecturers also face difficulties in creating truly inclusive learning environments.³¹ Their findings state: "Educators often lack a clear operational definition of inclusion, which complicates the implementation of inclusive strategies within higher education classrooms." This issue is not only theoretical but also linked to limited access to technology-based learning aids.

Somra reinforce these findings by emphasizing that lecturers' attitudes towards diversity are inconsistent. Some tend to rely on traditional learning approaches.³² One quote states: "Although most faculty members endorse inclusive values, a significant number rely on conventional teaching methods that exclude non-normative learners." This finding suggests a discrepancy between inclusive ideology and actual practice in the field.

Regarding policy and institutional structure, López Gómez note that higher education in Colombia faces serious challenges in translating inclusion policies into effective practices.³³ They state: "Despite a progressive legislative framework, institutional capacity remains weak, particularly in providing assistive technologies and adaptive learning environments." This barrier underscores the need for systemic intervention and sustained infrastructure support.

On the other hand, the quality of life approach is a focus in the study by Amor Alba Aza et al., where they design an index to assess the success of inclusion strategies for students with intellectual and developmental disabilities at the primary school level. Their findings show: "The Quality of Life Index offers a measurable and dynamic tool to evaluate how inclusive strategies impact students' daily educational experiences." The use of this tool allows for data-based assessments and can be integrated within the UDL framework.

Gonzalo and Verdugo also highlight that the Quality of Life Supports Model has a positive impact on the integration of students with special needs in higher education environments.³⁴ They explain: "Our results suggest that personalized supports combined with technological tools significantly enhance inclusive participation among students with disabilities." Therefore, the role of technology in supporting learning flexibility is strongly emphasized in this finding.

³¹ Altes et al., "Higher Education Teachers' Understandings of and Challenges for Inclusion and Inclusive Learning Environments: A Systematic Literature Review."

³² Ramdas et al., "Teachers' Attitudes towards Equity, Diversity, and Inclusion in Higher Education: A Scoping Review."

³³ Gómez, Farieta-Barrera, and Sarmiento, "Evaluation of Policies for Disability and Social Inclusion in Colombian Higher Education."

³⁴ Gonzalo et al., "Impact of the Quality of Life Supports Model on the Inclusion of Students with Disabilities in Higher Education: A Scoping Review."

Ciurana and García found that most lecturers feel unprepared to face the dynamics of inclusive learning, particularly with autistic students.³⁵ One quote states: "Lecturers voiced feelings of anxiety and uncertainty, often stating: 'Help! I feel unprepared to accommodate students with autism in my lectures.'" This quote highlights the tension educators face when they lack the proper pedagogical and psychological tools to handle diversity in the classroom.

In a multicultural and global context, Sousa emphasize that cultural intelligence is key to expanding the reach of inclusion.³⁶ They state: "Cultural intelligence allows educators to navigate the complexities of globalized classrooms, where cultural differences intersect with learning needs." This implies that non-technical skills, such as cultural empathy, are complementary aspects of 21st-century inclusive education.

A study by Le Fanu et al. in Papua New Guinea found that the implementation of inclusion is often merely administrative, without deep substance.³⁷ A quote from the article states: "Inclusion is treated as physical placement rather than meaningful participation." This statement highlights the need for an approach that not only places students in the classroom but also ensures they can engage actively and meaningfully.

Finally, research by AlKharouf discusses barriers to inclusion in higher education for refugees in Jordan.³⁸ They note: "Many refugee students are doubly marginalized – by systemic exclusion and by lack of digital access." These barriers indicate that inclusion in the context of vulnerable groups requires affirmative policies based on digital and adaptive technologies.

Table 2. Distribution of Focus Findings Based on Geographical Context and Education Level

Geographical Context	Education Level	Focus of Findings
Spain	Primary Education	Quality of Life Index to measure the success of inclusion strategies for students with intellectual and developmental disabilities (Amor Alba Aza et al., 2025).

³⁵ Barrera Ciurana and Moliner García, "How Does Universal Design for Learning Help Me to Learn?": Students with Autism Spectrum Disorder Voices in Higher Education."

³⁶ Mendes-Sousa et al., "Teacher-Preschool Student Relationships and Their Associations with Child Mental Health Problems."

³⁷ Le Fanu, Kawane, and Tesni, "Inclusion into What? Education Provision for Students with Disabilities and Additional Learning Needs in Papua New Guinea."

³⁸ AlKharouf et al., "Integrative Strategies for Social Inclusion and Equity: Enhancing Refugee Access to Higher Education in Jordan."

Spain	Primary Education	The use of digital tools and technologies in inclusive education for students with hearing impairments (Sai Keerthan et al., 2025).
Spain	Higher Education	The impact of personalized supports combined with technological tools in enhancing inclusive participation (Gonzalo & Verdugo, 2024).
Spain	Higher Education	The role of UDL in providing accessible and flexible learning environments for students with autism (Ciurana & García, 2025).
Netherlands	Higher Education	The role of technology in supporting learning flexibility and the integration of students with special needs (Gonzalo & Verdugo, 2024).
Colombia	Higher Education	Discrepancy between inclusive policies and actual infrastructure in higher education (López Gómez et al., 2025).
Jordan	Higher Education	Barriers faced by refugees in accessing inclusive higher education due to systemic exclusion and lack of digital access (AlKharouf et al., 2024).
Papua New Guinea	Higher Education	Inclusion is treated as physical placement rather than meaningful participation (Le Fanu et al., 2025).
Global (Multicultural Context)	Higher Education	The importance of cultural intelligence in fostering global collaboration and inclusion in diverse educational settings (Sousa et al., 2025).
Global (Higher Education)	Higher Education	Lack of clear operational definitions of inclusion and difficulty in implementing inclusive strategies (Korthals Altes et al., 2024; Somra et al., 2025).

CONCLUSION

This study presents a comprehensive narrative review on the integration of Universal Design for Learning (UDL) principles and digital technology within the context of 21st-century inclusive education. Based on the analysis of 15 relevant international journal articles, it was found that the implementation of inclusive education still faces significant challenges in terms of educator preparedness, policy and infrastructure limitations, and the underutilization of adaptive technology. The findings indicate that many educators, both at the primary and higher education levels, lack a comprehensive understanding and adequate skills to implement

inclusive and differentiated learning. This issue is exacerbated by the absence of continuous training, limited institutional support, and unequal access to technology across various social and geographical contexts.

The main contribution of this study to the academic field is the assertion that inclusive education in the 21st century cannot be separated from digital transformation and flexible learning design paradigms such as UDL. This research positions technology not just as an assistive tool but as a structural foundation for designing learning that is responsive to diversity. Furthermore, approaches based on quality of life, cultural intelligence, and recognition of the socio-political context of learners become key elements in developing a substantially inclusive educational system. Thus, this review broadens the conceptual horizon of inclusive education from a normative approach to a systemic and ecosystemic approach.

As a suggestion for future research, more in-depth field studies are needed to examine the effectiveness of UDL implementation in various educational settings, particularly those that integrate digital technology in a tangible way. Additionally, qualitative research exploring the subjective experiences of students with special needs, refugees, or other minority groups within the inclusive education system could provide a more holistic understanding. It is also recommended to develop standardized evaluation instruments to assess the quality of UDL implementation empirically, as well as cross-country studies to identify best practices that can be replicated in various local contexts. Ultimately, strengthening collaboration between researchers, policymakers, and education practitioners is crucial to bridging the gap between theory and practice in 21st-century digital inclusive education.

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