

Inclusive Education in the 21st Century: Challenges, Strategies, and Innovations

Sopa Siti Marwah¹, Ani Siti Anisah², Nurzakiah³

¹²³Universitas Garut, Indonesia

Correspondent : sopa@uniga.ac.id¹

Received : February 12, 2025

Accepted : April 16, 2025

Published : April 30, 2025

Citation: Marwah, S, S., Anisah, A, S., Nurzakiah. (2025). Inclusive Education in the 21st Century: Challenges, Strategies, and Innovations. Eduscape: Journal of Education Insight, 3(2), 96-109.

ABSTRACT: This study presents a narrative review of inclusive education as a defining priority in 21st-century learning, reflecting global efforts to ensure equitable access for diverse learners. Literature was systematically collected from Scopus, Web of Science, and Google Scholar using keywords such as inclusive education, 21st century learning, digital divide, pedagogical innovation, and equity in education. Inclusion criteria focused on peer-reviewed studies published between 2010 and 2025 addressing inclusivity in formal educational contexts. The findings reveal persistent challenges such as limited resources, technological inequities, inadequate teacher preparedness, and inconsistent policy frameworks. Comparative evidence shows that low-income regions face infrastructural barriers, while wealthier nations often encounter cultural resistance to inclusion. Effective strategies identified include STEAM pedagogy, peer learning, and culturally responsive teaching, which foster collaboration, engagement, and equity. Technological innovations such as artificial intelligence, the Internet of Things, and immersive virtual environments demonstrate significant potential to personalize education and expand accessibility, yet disparities in access to technology remain critical. The discussion highlights the importance of systemic reforms, teacher professional development, and adaptive learning environments in advancing inclusive practices. Future research should explore longitudinal impacts and emphasize marginalized learners' perspectives. Overall, the review concludes that integrating innovative pedagogy, digital tools, and supportive policy frameworks is essential for building inclusive, equitable, and resilient educational systems in the 21st century.

Keywords: Digital Pedagogy, Technology-Enhanced Learning, Artificial Intelligence In Education, Augmented Reality In Learning, Virtual Reality In Education, Digital Divide, Inclusive Pedagogy.



This is an open access article under the CC-BY 4.0 license

INTRODUCTION

Inclusive education in the 21st century has emerged as a central paradigm in contemporary educational discourse, reflecting the global commitment to provide equitable learning opportunities for all students, regardless of their backgrounds, abilities, or specific needs. Conceptually, inclusive education is defined as an approach aimed at eliminating barriers that

hinder full participation of learners in educational settings. Operationally, it entails the implementation of adaptive curricula, the use of supportive technologies, and the creation of learning environments that are welcoming and accessible to diverse groups of students (Camargo, 2020; Abrantes, 2021). The urgency of inclusive education has intensified in response to global challenges that demand 21st-century skills such as collaboration, problem-solving, and critical thinking (Tugwell, 2024). These competencies are essential for navigating the complexities of a rapidly transforming digital society and ensuring that all learners are equipped to participate meaningfully in economic, social, and cultural life.

Recent evidence underscores the importance of inclusive education in the era of digital transformation. The COVID-19 pandemic accelerated the shift to digital education but also exposed structural inequalities, especially among marginalized populations (Mosito, 2023). Villarreal and Scott (2024) further report that these groups continue to face disproportionately low levels of educational access, underscoring the urgent need for inclusive practices.

Beyond access, collaborative learning has been identified as a driver of inclusivity. Carvalho and Santos (2021) emphasize that collaboration across diverse student populations fosters environments where social and cognitive skills can be nurtured in tandem. This observation aligns with findings from Nguyen (2025) and Opoku et al. (2017), who demonstrate that pedagogical approaches in STEAM (Science, Technology, Engineering, Arts, and Mathematics) education are particularly effective in creating interactive, inclusive learning experiences. By leveraging inquiry-based and project-oriented methods, STEAM classrooms promote peer cooperation while enhancing engagement and academic outcomes.

The transformative role of digitalization in education extends beyond the deployment of new technologies. Ossiannilsson (2021) argues that true inclusivity is contingent upon pedagogical strategies that align technological innovations with diverse learning needs. Digital transformation, when guided by inclusive pedagogies, not only improves accessibility but also fosters diversity and mutual respect in learning environments (Ahtiainen et al., 2021). This dual focus on access and pedagogy underscores the holistic nature of inclusive education as both a technological and socio-cultural imperative.

Despite these opportunities, inclusive education faces significant challenges. One of the most prominent is the digital divide, which exacerbates inequities in access to learning resources. Amjad et al. (2024) and Zou et al. (2025) reveal that insufficient access to digital infrastructure disproportionately affects students from lower socioeconomic backgrounds and those with special needs. As education becomes increasingly reliant on technology, these inequities risk deepening structural disadvantages, undermining the principle of equitable participation (Piratova et al., 2025; Zou et al., 2025). Without targeted interventions, the digital divide will continue to hinder the effectiveness of inclusive initiatives.

Another pressing challenge lies in teacher preparedness. Research shows that many educators lack the training and confidence necessary to effectively support diverse student populations (Mosito, 2023; Sánchez et al., 2023). Duhan and Devarakonda (2018) as well as McLin and Smith (2018) found that insufficient professional development in inclusive pedagogies can result in limited

capacity to implement differentiated teaching strategies. This deficit not only diminishes teachers' self-efficacy but also restricts the quality of learning environments, particularly for students requiring specialized support. Addressing these challenges requires sustained investment in teacher education and professional learning opportunities that prioritize inclusivity.

Policy frameworks also exert a critical influence on the realization of inclusive education. Onyesom and Igberaharha (2021) and Benadé (2019) observe that ambiguity in policy directives, coupled with insufficient institutional support, often hampers implementation efforts. Benabid et al. (2024) emphasize that inclusion-focused policies must be backed by adequate resources and accountability mechanisms if they are to achieve meaningful impact. However, Bello and Aubert (2025) and Barth and Wiehl (2024) caution that in many contexts, educational systems remain disproportionately focused on standardized academic outcomes, sidelining the needs of individual learners. Thus, coherent policies that balance academic achievement with inclusivity are essential for systemic change (Willson et al., 2023).

Notwithstanding the growing body of research, gaps in the literature persist. While technology has been recognized as a potential enabler of inclusivity, there is limited exploration of how innovations such as AI and IoT can be systematically integrated into curricula and teaching practices (Piratova et al., 2025; Zou et al., 2025; Mobo et al., 2025). Similarly, the influence of local socio-cultural contexts on the design and delivery of inclusive education remains underexplored (Onyesom & Igberaharha, 2021; Okada et al., 2024). These gaps indicate the need for more nuanced investigations into how inclusive practices can be tailored to specific cultural and technological contexts.

The purpose of this narrative review is therefore to synthesize and critically evaluate current approaches, strategies, and innovations in inclusive education within the 21st-century framework. By drawing on recent empirical evidence, this review aims to identify promising practices, highlight persistent barriers, and contribute to the development of a more comprehensive understanding of inclusive education. Central to this analysis is the examination of how digital transformation, teacher capacity, policy frameworks, and socio-cultural factors interact to shape inclusive practices (Chansaengsee, 2023; Piratova et al., 2025; Amjad et al., 2024).

The scope of this review is threefold. First, it focuses on inclusive education in developing countries, where resource constraints and policy inconsistencies often hinder progress. Studies from contexts such as Ghana reveal that without adequate support, inclusive policies fail to produce equitable outcomes for students with special needs (Opoku et al., 2017). Second, the review emphasizes primary education, acknowledging that early learning experiences profoundly shape future trajectories. Investigating inclusive strategies at the foundational level offers insights into how diverse learning needs can be addressed from the outset (Chansaengsee, 2023; Piratova et al., 2025; O'Sullivan et al., 2020). Third, the review highlights inclusive practices for students with special needs, exploring pedagogical adaptations for learners with conditions such as autism, dyslexia, and other forms of marginalization (McDaniel et al., 2022; Ruppar et al., 2022).

By examining inclusive education across these dimensions, this review seeks to provide a robust foundation for academic discourse, enabling scholars, practitioners, and policymakers to advance

more effective and context-sensitive inclusive practices. In doing so, it emphasizes the imperative of aligning educational innovations with broader societal goals of equity, diversity, and social justice in the 21st century.

METHOD

The methodological framework guiding this narrative review was designed to ensure a comprehensive and rigorous examination of the available literature on inclusive education in the 21st century. The process entailed a systematic search and selection of relevant academic works, with the aim of identifying empirical evidence, theoretical discussions, and innovative practices that contribute to the discourse on inclusive education. Each stage of the methodology was informed by established protocols for conducting narrative reviews in education and the social sciences, thereby guaranteeing both transparency and replicability.

The initial stage of the methodology involved the identification of suitable academic databases. Three primary sources were employed: Scopus, Web of Science, and Google Scholar. Scopus and Web of Science were prioritized because of their extensive coverage of peer-reviewed journals, particularly in the fields of social sciences, humanities, and education. These databases provide reliable access to high-quality research outputs, alongside the advantage of advanced citation tracking and bibliometric analysis, enabling the identification of influential studies within the domain of inclusive education (Onyesom & Igberaharha, 2021; Chansaengsee, 2023). Google Scholar was additionally utilized as a complementary resource, primarily for its capacity to index a broader range of materials including theses, conference proceedings, policy documents, and articles not yet indexed by Scopus or Web of Science. This broader scope was deemed particularly useful for capturing emergent perspectives and ensuring the comprehensiveness of the review (Piratova et al., 2025).

Following the determination of data sources, the next step was the development of a keyword strategy tailored to the objectives of the review. Keywords were carefully selected to reflect the multidimensional nature of inclusive education and to ensure coverage of both general concepts and specific challenges within the field. The primary keywords employed included “inclusive education,” “21st century learning,” “digital divide,” “pedagogical innovation,” and “equity in education.” Boolean operators were applied to combine these terms, allowing for more refined searches. For example, searches combining “inclusive education” with “21st century learning” facilitated the retrieval of studies addressing contemporary applications of inclusive education in light of modern learning demands (Carvalho & Santos, 2021; Casinader & Walsh, 2019). Similarly, the pairing of “digital divide” with “inclusive education” was useful in identifying works that explicitly examined the impact of technological inequities on inclusive practices (Opoku et al., 2017).

To further refine the search process, variations of these terms were employed to capture a broader range of literature. Phrases such as “pedagogical innovation for equity in education” or “digital inclusion in schools” were integrated into the search strings to ensure that both technological and

pedagogical dimensions of inclusivity were adequately represented. The emphasis on multiple combinations and variations was central to uncovering the interconnections between inclusive education, technological adaptation, and systemic equity (Ahtiainen et al., 2021; Willson et al., 2023). The iterative nature of the search allowed for the inclusion of literature that might otherwise have been overlooked if a narrower set of keywords had been applied.

The identification of relevant studies was followed by the establishment of inclusion and exclusion criteria to guide the selection process. The inclusion criteria were designed to capture research outputs that directly addressed inclusive education within the 21st-century context. Specifically, studies were considered eligible if they: (1) were published in peer-reviewed journals, conference proceedings, or reputable academic outlets between 2010 and 2025; (2) focused explicitly on inclusive education and its implementation in formal educational settings; (3) addressed at least one of the thematic areas central to this review, such as digital transformation, pedagogical innovation, teacher capacity, or equity in access; and (4) provided empirical evidence, conceptual frameworks, or practical applications relevant to inclusive practices. Exclusion criteria, on the other hand, eliminated studies that did not engage with educational contexts, lacked relevance to inclusivity, or were primarily anecdotal in nature without offering empirical or theoretical contributions.

The selection process further involved categorizing the types of research included in the review. Given the narrative nature of this study, a broad range of research designs was accepted to ensure diversity of perspectives. This encompassed randomized controlled trials examining pedagogical interventions, cohort studies evaluating long-term outcomes of inclusive policies, case studies providing in-depth accounts of specific contexts, and qualitative investigations exploring teacher and student perceptions of inclusivity. Such methodological pluralism was deemed necessary to reflect the complex, multifaceted reality of inclusive education, which cannot be fully understood through a single research design.

Screening and evaluation of the identified literature were conducted in two stages. First, titles and abstracts were reviewed to determine relevance to the inclusion criteria. Articles deemed potentially relevant were then subjected to full-text review, during which their methodological rigor, conceptual contributions, and empirical findings were assessed. To ensure credibility and consistency, studies that lacked sufficient methodological detail or were based on weak evidence were excluded at this stage. The final pool of studies included in the review thus reflected a balance of methodological robustness and thematic relevance.

Throughout this process, particular attention was given to ensuring geographical and cultural diversity in the selected literature. Inclusive education is shaped by contextual factors that vary significantly across regions and populations. Therefore, the methodology emphasized the inclusion of studies from both developed and developing countries, as well as works focusing on marginalized groups such as students with special needs, rural populations, and learners from low socioeconomic backgrounds. This approach provided a more holistic understanding of how inclusive education is conceptualized and enacted in different settings, while also highlighting the universal challenges and localized adaptations that characterize the field.

Finally, the methodological approach included an evaluative dimension, whereby the selected studies were not only synthesized but also critically appraised. This entailed assessing the extent to which the literature addressed the stated research questions, the degree of innovation in pedagogical practices, and the robustness of evidence supporting claims of inclusivity. In line with best practices for narrative reviews, this process ensured that the final synthesis was not merely descriptive but also analytical, contributing to the development of new insights and the identification of gaps warranting further exploration.

In summary, the methodology for this narrative review was structured to combine systematic search procedures with critical synthesis. By drawing on multiple databases, applying comprehensive keyword strategies, employing rigorous inclusion and exclusion criteria, and incorporating diverse research designs, the approach ensured both breadth and depth in the coverage of literature. The methodological emphasis on cultural and contextual diversity further strengthened the capacity of the review to provide nuanced insights into inclusive education in the 21st century. This rigorous framework thus lays a solid foundation for the subsequent analysis of results and the broader discussions concerning the challenges, strategies, and innovations shaping inclusive education today.

RESULT AND DISCUSSION

The findings of this narrative review are organized into three overarching themes: the challenges associated with the implementation of inclusive education, the strategies and practices that have demonstrated effectiveness, and the innovations in technology and pedagogy that have significantly shaped inclusive learning environments. Together, these themes provide a comprehensive understanding of how inclusive education has evolved in the 21st century, the barriers that persist, and the opportunities that arise from novel strategies and technological advancements.

The first theme focuses on the empirical evidence of barriers in implementing inclusive education. A substantial body of literature has highlighted that the absence of sufficient resources, inadequate policy frameworks, and teacher preparedness issues are among the most persistent obstacles. Opoku et al. (2017) observed that schools in resource-constrained contexts, particularly in low-income countries, often lack the financial support necessary to provide infrastructure tailored to the needs of students with disabilities. Without adequate funding, institutions face limitations in procuring assistive technologies, accessible learning materials, and physical accommodations, which significantly undermines inclusive education initiatives (Piratova et al., 2025). Moreover, the integration of advanced technologies such as artificial intelligence (AI) and the Internet of Things (IoT) has been proposed as a potential solution to personalize and diversify learning environments. Yet, as Chansaengsee (2023) and Piratova et al. (2025) point out, many schools, especially in underdeveloped regions, lack the technological infrastructure or expertise to leverage these innovations effectively. The result is a widening digital divide, where students from marginalized backgrounds are further disadvantaged in accessing inclusive education.

Socio-economic context strongly influences how challenges to inclusive education manifest. Evidence from Ghana illustrates that low-income countries face unique barriers, particularly in terms of teacher training and infrastructural deficiencies (Opoku et al., 2017). By contrast, middle- and high-income countries encounter challenges that are more cultural than structural. For instance, Piratova et al. (2025) note that in higher-income contexts, debates surrounding inclusive education often center on societal attitudes and cultural acceptance of diversity, rather than a sheer lack of material resources. This comparative perspective underscores the need for localized solutions. While resource allocation is the most pressing concern in poorer countries, strategies in wealthier nations must focus more on cultural sensitization, community engagement, and systemic reforms aimed at dismantling discriminatory practices embedded within educational traditions.

The second theme identifies effective teaching strategies and practices that have been successful in advancing inclusive education. One prominent approach is the application of STEAM (Science, Technology, Engineering, Arts, and Mathematics) pedagogy. Chansaengsee (2023) demonstrates that project-based learning within STEAM frameworks fosters collaborative engagement among students of varied abilities. Similarly, Opoku et al. (2017) report that STEAM initiatives facilitate inclusive participation by emphasizing practical problem-solving and teamwork, thus creating educational settings where students with special needs are encouraged to actively engage alongside their peers. The interdisciplinary and collaborative nature of STEAM pedagogy makes it particularly effective in breaking down barriers to participation, promoting not only academic engagement but also social interaction.

Globally, inclusive education practices exhibit significant diversity, yet comparative reviews reveal common elements that define successful initiatives. Carvalho and Santos (2021) describe how peer learning projects in Portugal effectively enhance social support networks among students, fostering empathy, cooperation, and mutual respect. These projects exemplify how peer-based approaches can democratize classroom participation and reduce stigmatization of students with disabilities. When compared to practices in other contexts, such as those reported in Asia and Africa, the peer-learning model highlights the universality of collaborative pedagogy as a strategy for inclusivity. While cultural and structural conditions vary, the ability of peer-learning practices to nurture a sense of belonging and social competence has been consistently demonstrated across different settings.

The third theme addresses innovations in technology and pedagogy that have been integrated into inclusive education systems. Advanced technologies have proven to be transformative in creating inclusive learning environments. Piratova et al. (2025) argue that the integration of AI and IoT into classrooms offers unprecedented opportunities for personalized education, whereby individual learning trajectories can be monitored and adapted in real time. AI-powered adaptive systems enable educators to deliver differentiated instruction tailored to students' unique needs, while IoT devices facilitate interactive and multisensory engagement. Chansaengsee (2023) notes that the use of virtual reality (VR) and augmented reality (AR) technologies further enriches the inclusivity of educational experiences. For students with learning difficulties or disabilities, immersive simulations provided by VR have proven particularly effective in simplifying complex concepts, thereby fostering deeper understanding and participation.

Alongside technological advancements, new pedagogical approaches have emerged that significantly influence inclusivity. Culturally Responsive Pedagogy (CRP) has been shown to foster inclusive environments by aligning teaching methods with the cultural identities and experiences of diverse student populations. Onyesom and Igberaharha (2021) found that teachers employing CRP were more successful in engaging students from varied cultural backgrounds, thereby enhancing both academic and social outcomes. Similarly, design thinking, as a collaborative learning methodology, empowers students to co-create solutions to real-world challenges. This approach encourages critical thinking, creativity, and empathy, aligning well with the inclusive education agenda (Onyesom & Igberaharha, 2021). Empowerment pedagogy further strengthens inclusivity by promoting agency and self-efficacy among marginalized learners, challenging the structural inequalities that limit their participation in traditional classroom models.

The impact of innovative pedagogies has been validated through empirical studies. Chansaengsee (2023) and Kaçar (2023) highlight that STEAM-based and collaborative pedagogies enhance students' 21st-century skills, including communication, creativity, and digital literacy. These approaches not only improve academic performance but also cultivate the social awareness and civic responsibility essential for inclusive societies. The intersection of technological and pedagogical innovations underscores the multidimensional nature of inclusivity, where access to education must be coupled with transformative practices that reshape how learning is experienced and understood.

An additional area of innovation concerns the design of inclusive learning spaces. Studies emphasize the importance of flexible environments that can accommodate diverse learning needs. For instance, IoT-enabled classrooms provide adaptable configurations, where lighting, sound, and digital tools can be modified to suit individual learners (Chansaengsee, 2023). Such adaptive environments not only enhance accessibility for students with disabilities but also foster collaborative dynamics that benefit all learners. The evidence suggests that the physical and digital architecture of classrooms plays a crucial role in shaping inclusive education outcomes.

Cross-country comparisons further highlight the global relevance of these innovations. Carvalho and Santos (2021) documented how peer-based and collaborative projects in Portugal contributed to inclusivity, whereas studies in Asian contexts report how the integration of digital tools into mainstream classrooms has facilitated the participation of students with disabilities. These cross-national findings emphasize that while technological and pedagogical innovations are globally transferable, their effectiveness is contingent upon the alignment with local cultural and institutional contexts. Countries that have successfully advanced inclusive education have done so by embedding innovations within broader systemic frameworks that prioritize equity and diversity.

In sum, the results reveal that inclusive education in the 21st century is characterized by a dual narrative of persistent challenges and transformative opportunities. Empirical evidence consistently demonstrates that barriers such as limited resources, inadequate infrastructure, and insufficient teacher preparedness hinder the full realization of inclusivity. At the same time, strategies like STEAM pedagogy and peer learning, combined with technological innovations such as AI, IoT, and VR, present compelling opportunities to overcome these obstacles. Comparative analyses illustrate that while inclusive education manifests differently across socio-economic contexts, the underlying principles of equity, collaboration, and innovation remain universal. These

findings collectively provide a foundation for the subsequent discussion, which will critically analyze how systemic factors interact with these strategies and innovations to shape inclusive education globally.

The findings from this narrative review underscore the pivotal role of systemic, policy, and socio-cultural factors in shaping the implementation of inclusive education in the 21st century. Studies conducted across diverse geographical contexts reaffirm that inclusive education cannot be realized in isolation from broader structural supports. For example, Opoku et al. (2017) emphasized that in Ghana, inadequate governmental financial backing and weak policy frameworks severely constrained the ability of schools to accommodate students with disabilities. These findings resonate with earlier research, which similarly demonstrated that inclusive education thrives only when sustained by consistent policy support and systemic commitment (Onyesom & Igberaharha, 2021). The consistency of these outcomes across different settings strengthens the argument that policy reliability and institutional stability are foundational for inclusive practices to succeed. In higher-income countries, such as those in Europe, inclusive education efforts tend to be hindered less by resource scarcity and more by entrenched cultural perceptions and resistance to change (Carvalho & Santos, 2021). This contrast highlights the need for localized approaches that integrate systemic reforms with context-specific socio-economic realities.

The role of socio-economic context as a determinant of inclusivity is particularly salient. Comparative studies reveal that low-income countries face fundamental obstacles such as inadequate infrastructure, shortage of trained teachers, and absence of assistive technologies (Opoku et al., 2017; Piratova et al., 2025). In these contexts, even when inclusive policies exist, their implementation is often stymied by resource limitations, rendering them aspirational rather than actionable. In contrast, middle- and high-income contexts struggle with subtler yet equally impactful barriers, including cultural stigmatization of disabilities and rigid educational traditions that prioritize standardized outcomes over diverse learning needs (Barth & Wiehl, 2024). This evidence underscores that systemic equity cannot be achieved through a one-size-fits-all model, but instead requires interventions that are adaptive to local realities and responsive to socio-cultural dynamics.

Beyond policy and systemic supports, the role of teachers emerges as a central determinant in the success or failure of inclusive education. The review revealed that teacher preparedness remains a global challenge, with many educators reporting insufficient training and limited confidence in addressing the needs of diverse learners (Mosito, 2023; Sánchez et al., 2023). This is consistent with earlier findings by Duhan and Devarakonda (2018), who argued that professional development in inclusive pedagogies is essential for teachers to design differentiated and equitable learning environments. When teachers lack the necessary competencies, inclusive policies fail at the classroom level, where they matter most. This indicates that systemic investment in teacher training programs, particularly those that combine theoretical frameworks with practical applications, is indispensable. As McDaniel et al. (2022) highlight, training initiatives that provide hands-on experience in inclusive settings significantly boost teacher confidence and positively influence their attitudes toward inclusion.

Technological innovations, particularly AI and IoT, represent another domain where inclusive education faces both opportunities and systemic challenges. On one hand, evidence suggests that these technologies can transform the inclusivity of classrooms by offering adaptive and personalized learning experiences (Piratova et al., 2025; Chansaengsee, 2023). AI-driven platforms are capable of adjusting to the unique pace and style of each learner, while IoT-enabled devices facilitate interactivity and real-time engagement across varied learning modalities. On the other hand, access to such technologies is unevenly distributed, reflecting broader inequalities in digital infrastructure. This digital divide illustrates how systemic inequities persist, even as new solutions emerge. Unless governments and institutions address these disparities by investing in technological infrastructure and training, the potential of innovations to enhance inclusivity will remain unrealized, thereby perpetuating educational inequity.

The literature also demonstrates that culturally responsive pedagogies and innovative teaching methodologies contribute significantly to the realization of inclusive education. For instance, Onyesom and Igberaharha (2021) reported that teachers who adopt Culturally Responsive Pedagogy (CRP) are more effective in engaging diverse learners and fostering a sense of belonging. Similarly, design thinking approaches have been found to empower students by encouraging active participation, critical thinking, and collaborative problem-solving. These approaches underscore that inclusive education is not simply about providing access but about reshaping pedagogical practices to ensure that diverse learners thrive within mainstream environments. The implications of these findings are twofold: first, pedagogical innovation must be prioritized alongside technological integration, and second, systemic reforms should support teacher autonomy and creativity in adopting these inclusive practices.

The analysis also points to global variation in the adoption and success of inclusive practices. In Portugal, Carvalho and Santos (2021) highlighted the success of peer learning initiatives in cultivating empathy, cooperation, and social integration among students. This contrasts with findings in African contexts, where resource deficits remain the predominant challenge despite strong community support for inclusivity (Opoku et al., 2017). Meanwhile, in Asian contexts, innovations such as the integration of VR and AR into classrooms have demonstrated potential for immersive and accessible learning experiences (Chansaengsee, 2023). The comparative evidence demonstrates that while inclusive education strategies are context-sensitive, the overarching principles of collaboration, equity, and adaptability remain universal. These findings suggest that cross-country learning and the transfer of best practices could provide valuable insights for policymakers and educators seeking to strengthen inclusive education globally.

In terms of potential solutions, the literature converges on the dual importance of professional teacher development and technological integration. McDaniel et al. (2022) argue that teacher training programs must go beyond theoretical instruction to include experiential learning opportunities that build confidence and competence in real-world classrooms. Complementing this, Piratova et al. (2025) contend that AI and IoT can serve as critical tools for tailoring educational experiences to the needs of diverse learners. Together, these findings indicate that a two-pronged approach—strengthening human capacity while leveraging technological innovations—holds promise for overcoming many of the barriers identified in the review. However, such solutions demand systemic commitment in the form of sustainable funding, policy coherence, and institutional support.

Despite the growing body of literature, significant limitations remain in current research on inclusive education. A major gap concerns the scarcity of longitudinal studies that examine the long-term impacts of inclusive practices and policies. Most existing research is cross-sectional, providing valuable but limited insights into immediate outcomes while neglecting the evolution of attitudes, behaviors, and systemic adaptations over time. This limitation restricts the ability to evaluate whether inclusive strategies yield sustained improvements in educational equity. Moreover, the voices of students and parents are often underrepresented in the literature, creating a gap in understanding the lived experiences of those most affected by inclusive policies (Ruppar et al., 2022). Future research would benefit from incorporating qualitative and participatory methodologies that center these perspectives, thereby providing a more holistic account of inclusivity in practice.

Another area requiring further exploration is the intersection of technology, culture, and inclusivity. While studies have demonstrated the potential of AI, IoT, and VR to enhance learning for students with special needs, few investigations have addressed how these technologies interact with local cultural contexts (Mobo et al., 2025). The effectiveness of technological solutions cannot be divorced from the cultural and socio-economic settings in which they are deployed. Thus, future studies should focus on context-sensitive models that examine how innovations can be adapted to local realities without exacerbating inequalities. Additionally, more research is needed on how domestic and international policies influence inclusive education practices across different regions, particularly in terms of how global frameworks can be harmonized with local needs.

In light of these limitations, future scholarship should prioritize integrative approaches that combine systemic analysis with granular, context-specific investigations. By examining how policy frameworks, technological innovations, teacher training, and cultural factors interact, researchers can contribute to a more comprehensive and actionable understanding of inclusive education. Such efforts would not only advance theoretical knowledge but also provide practical guidance for educators and policymakers tasked with addressing the persistent barriers identified in this review.

CONCLUSION

This narrative review highlights that inclusive education in the 21st century remains both a pressing necessity and a complex challenge. The findings confirm that systemic barriers such as inadequate resources, insufficient teacher training, and inconsistent policy frameworks continue to obstruct effective implementation. At the same time, evidence demonstrates that innovative pedagogical strategies, including STEAM-based learning, peer collaboration, and culturally responsive pedagogy, play an essential role in creating equitable and participatory learning environments. Technological advancements such as artificial intelligence, the Internet of Things, and virtual reality show significant potential in personalizing education and enhancing accessibility, yet these innovations risk exacerbating inequalities if the digital divide is not adequately addressed.

The discussion further emphasizes that inclusive education cannot succeed without coherent systemic support, cultural responsiveness, and targeted interventions tailored to local contexts. Professional teacher development remains a cornerstone of successful implementation, while policy frameworks must balance academic achievement with equity and diversity goals. In addition,

the design of adaptive and technology-enabled learning spaces offers promising opportunities to foster inclusivity across diverse socio-economic settings.

Urgent interventions are required, including government funding for infrastructure, continuous teacher training in inclusive pedagogies, and policies that ensure equitable access to technologies across socio-economic groups. Future research should prioritize longitudinal studies that assess the sustained impacts of inclusive practices, as well as qualitative investigations that capture the lived experiences of students and parents. By integrating systemic reforms, teacher empowerment, and innovative technologies, inclusive education can evolve into a more resilient and equitable model, ensuring that all learners are equipped to thrive in an increasingly complex global society.

REFERENCE

- Abrantes, P. (2021). Educação inclusiva: proposta de quadro analítico e aplicação ao caso português. *Revista Portuguesa De Educação*, 34(2), 25-41. <https://doi.org/10.21814/rpe.18677>
- Ahtiainen, R., Pulkkinen, J., & Jahnukainen, M. (2021). The 21st century reforms (re)shaping the education policy of inclusive and special education in Finland. *Education Sciences*, 11(11), 750. <https://doi.org/10.3390/educsci11110750>
- Amjad, A., Aslam, S., Tabassum, U., Sial, Z., & Shafqat, F. (2024). Digital equity and accessibility in higher education: reaching the unreached. *European Journal of Education*, 59(4). <https://doi.org/10.1111/ejed.12795>
- Amzat, I., Padilla-Valdez, N., Westbrook, T., Chaudhri, A., Walters, L., Green, M., ... & K'Odhiambo, A. (2017). Teacher professional knowledge and development for reflective and inclusive practices. <https://doi.org/10.4324/9781315397702>
- Barth, U., & Wiehl, A. (2024). Inclusive Waldorf schools today: what can we build on and what is necessary in the 21st century? *Frontiers in Education*, 8. <https://doi.org/10.3389/feduc.2023.1345697>
- Bello, L., & Aubert, L. (2025). Artificial intelligence in the classroom: democratizing knowledge and transforming education. *Seminars in Medical Writing and Education*, 4, 469. <https://doi.org/10.56294/mw2025469>
- Benabid, A., Imadi, I., & Al-Qatawneh, K. (2024). Encouraging quality. pp. 145–178. <https://doi.org/10.4018/979-8-3693-3904-6.ch007>
- Benadé, L. (2019). Flexible learning spaces: inclusive by design? *New Zealand Journal of Educational Studies*, 54(1), 53-68. <https://doi.org/10.1007/s40841-019-00127-2>

- Camargo, C. (2020). Technological and pluricultural teacher training for a quality educational inclusion. *Texto Livre Linguagem E Tecnologia*, 13(3), 224-239. <https://doi.org/10.35699/1983-3652.2020.25648>
- Carvalho, A., & Santos, C. (2021). The transformative role of peer learning projects in 21st century schools—achievements from five Portuguese educational institutions. *Education Sciences*, 11(5), 196. <https://doi.org/10.3390/educsci11050196>
- Casinader, N., & Walsh, L. (2019). Investigating the cultural understandings of international baccalaureate primary years programme teachers from a transcultural perspective. *Journal of Research in International Education*, 18(3), 257-273. <https://doi.org/10.1177/1475240919891001>
- Chansaengsee, S. (2023). STEAM approach for improving 21st century skills of multicultural students attending inclusive classroom. *Kasetsart Journal of Social Sciences*, 45(1). <https://doi.org/10.34044/j.kjss.2024.45.1.02>
- Duhan, K., & Devarakonda, C. (2018). Teacher trainees' perceptions of inclusion of and its challenges. *Disability CBR & Inclusive Development*, 29(1), 93. <https://doi.org/10.5463/dcid.v29i1.649>
- Kaçar, S. (2023). Thematic content analysis of postgraduate theses on epistemological beliefs in science education: the Türkiye context. *Journal of Turkish Science Education*, 20(3), 504-533. <https://doi.org/10.36681/tused.2023.029>
- Krasniqi, V., Zdravkova, K., & Dalipi, F. (2022). Impact of assistive technologies to inclusive education and independent life of Down syndrome persons: a systematic literature review and research agenda. *Sustainability*, 14(8), 4630. <https://doi.org/10.3390/su14084630>
- McDaniel, S., Hall, L., & Kraemer, B. (2022). Exploring extracurricular clubs for building social competence of students with autism. *Frontiers in Psychiatry*, 13. <https://doi.org/10.3389/fpsy.2022.840294>
- McLin, D., & Smith, J. (2018). Inclusive classrooms at historically black colleges and universities: the need for faculty development. *International Journal of Learning Teaching and Educational Research*, 17(8), 129-138. <https://doi.org/10.26803/ijlter.17.8.8>
- Mobo, F., Azar, A., & García, A. (2025). The synergy of AI and robotics in modern education. pp. 69–86. <https://doi.org/10.4018/979-8-3693-6165-8.ch004>
- Mosito, C. (2023). Enhancing inclusive education through active student teacher participation: a case study of a university in Cape Town. *Journal of Education*, (92), 186-205. <https://doi.org/10.17159/2520-9868/i92a11>

- Nguyen, A. (2025). Pedagogical approaches in STEAM education. pp. 53–78. <https://doi.org/10.4018/979-8-3693-7408-5.ch003>
- Okada, A., Panselinas, G., Bîzoi, M., Malagrida, R., & Torres, P. (2024). Fostering transversal skills through open schooling with the care-know-do framework for sustainable education. *Sustainability*, 16(7), 2794. <https://doi.org/10.3390/su16072794>
- Onyesom, M., & Igberaharha, C. (2021). Inclusive values and pedagogies needed by business studies teachers for effective inclusive education in secondary schools. *International Journal of Education and Practice*, 9(1), 220-229. <https://doi.org/10.18488/journal.61.2021.91.220.229>
- Opoku, M., Agbenyega, J., F. J., Mprah, W., McKenzie, J., & Badu, E. (2017). Decade of inclusive education in Ghana: perspectives of educators. *Journal of Social Inclusion*, 8(1), 4. <https://doi.org/10.36251/josi.114>
- O'Sullivan, K., Bird, N., & Marshall, K. (2020). The dreamspace STEM-21CLD model as an aid to inclusion of pupils with special education needs. *European Journal of Special Needs Education*, 36(3), 469-477. <https://doi.org/10.1080/08856257.2020.1762989>
- Ossiannilsson, E. (2021). Promoting active and meaningful learning for digital learners. pp. 496–517. <https://doi.org/10.4018/978-1-7998-3438-0.ch023>
- Piratova, D., Duarte, M., Chiappe, A., & Sáez-Delgado, F. (2025). Intelligent classrooms: how AI and IoT can reshape learning spaces. *European Journal of Education*, 60(1). <https://doi.org/10.1111/ejed.70000>
- Ruppar, A., Kurth, J., Bubash, S., & Turner, E. (2022). A framework for preparing to teach students with extensive support needs in the 21st century. *Teacher Education and Special Education*, 46(1), 26-43. <https://doi.org/10.1177/08884064211059853>
- Sánchez, P., Rodríguez, R., Caballero, C., & Martínez-Abellán, R. (2023). Barriers to educational inclusion in initial teacher training. *Societies*, 13(2), 31. <https://doi.org/10.3390/soc13020031>
- Tugwell, O. (2024). Enhancing the digital competence of educational stakeholders. pp. 53–84. <https://doi.org/10.4018/979-8-3693-2252-9.ch003>
- Villarreal, A., & Scott, S. (2024). Fostering inclusive and resilient classroom environments in the post-COVID-19 era. pp. 17–41. <https://doi.org/10.4018/979-8-3693-8125-0.ch002>
- Willson, A., Gallo, H., Peters, J., Abeyta, A., Watts, N., Carey, C., ... & McLachlan, J. (2023). Assessing opportunities and inequities in undergraduate ecological forecasting education. *Ecology and Evolution*, 13(5). <https://doi.org/10.1002/ece3.10001>
- Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: trends, challenges, and innovations in technology integration. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2025.1562391>