# **Journal of Learning and Technology**

Vol. 3 No. 1 June (2024) | 19-28 p-ISSN: 2962-2123 e-ISSN: 2964-6545

**DOI:** <u>10.33830/jlt.v3i1.9731</u>



# PROMOTING INCLUSIVITY THROUGH TECHNOLOGY: A LITERATURE REVIEW IN EDUCATIONAL SETTINGS

# Citra Eka Wulandari<sup>1</sup>, Fauzan Akmal Firdaus<sup>2</sup>, Farida Saifulloh<sup>3</sup>

<sup>1</sup>Islamic Education, STIT Darul Ishlah, Tulang Bawang, Lampung, Indonesia <sup>2</sup>Islamic Management Education, STIT Az Zahra, Tasikmalaya, Indonesia <sup>3</sup>Islamic Education, Universitas Negri Surakarta, Surakarta, Indonesia

#### **ARTICLE INFORMATION**

# Article History:

Submitted : 29-Jul-2024 Accepted : 14-Aug-2024 Published : 25-Aug-2024

#### Keywords:

Inclusive Education Integration Technology Literature Review

# Correspondence:

Citra Eka Wulandari STIT Darul Ishlah, Tulang Bawang, Indonesia

Email: wulanzcytra@gmail.com

#### **ABSTRACT**

**Abstract:** Inclusive education has been a major focus of global education policy conversations over the past few decades. Along with the rapid development of technology, the role of technology in supporting inclusive education has become an increasingly widely explored subject of research. Technology integration in the context of inclusive education involves the use of various tools and platforms that are accessible to students with special needs. The purpose of this research is to explore various aspects of the use of technology promoting inclusion in education, by identifying opportunities, challenges and important factors that should be considered in order to create a more inclusive and equitable education for all individuals. The research method used is a literature review, exploring data sources such as journal articles, books, research reports and other academic publications relevant to this topic. The results of this study show that technology integration has had a significant positive impact in improving educational accessibility for students, allowing more efficient personalization of learning, and increasing student engagement and participation in the learning process. However, challenges such as technology infrastructure, teacher training, technology suitability, data privacy and necessary policy support need to be addressed for the benefits of technology to be optimized in supporting educational inclusion as a whole.

# **INTRODUCTION**

Inclusive education has become an important topic in global education policy discussions over the past few decades. The concept emphasizes the importance of creating a learning environment that is open and accepting of differences, and provides equal opportunities for all students, regardless of their background or abilities. With the rapid advancement of technology, the role of technology in supporting inclusive education has become an increasingly explored subject of research. The application of technology in inclusive education includes various tools and platforms that are accessible to students with special needs, such as screen reader software for visually impaired students or gamification-based learning apps for children with developmental disabilities. In addition, technology also allows teachers to customize their teaching methods to better suit the individual needs of each student, thus improving the effectiveness of the teaching and learning process. Thus, the integration of technology in inclusive education not only improves accessibility but also supports the achievement of better learning outcomes for all students.

Technology is not only seen as a learning aid but also as a catalyst for creating a more inclusive educational environment and promoting equality of access for all learners. Recent research shows that appropriate technology integration can help overcome traditional barriers to inclusive education, such as lack of resources, the digital divide and challenges in accommodating students' special needs (Cullen et al., 2019; Díaz-Gandasegui & Soro, 2021). Technology, then, enables more personalized learning, allowing students to learn according to their own needs and pace. Thus, the use of technology can help reduce the educational gap between students with different backgrounds. Overall, the integration of technology in education not only improves learning effectiveness but also promotes a more inclusive and equal environment for all learners.

One area that has received significant attention is the use of assistive technology in supporting students with disabilities. These technologies can help improve access, participation and academic achievement for students with special needs, such as learning disabilities, physical or sensory disabilities (Alnahdi, 2020; Gokool-Baurhoo & Mbera, 2023). Examples include screen reader software, alternative keyboards, and mobility aids. In addition, digital technologies have also played an important role in facilitating distance learning and virtual education. This has become particularly relevant during the COVID-19 pandemic, when many schools were forced to switch to an online learning model (Basilaia & Kvavadze, 2020; Hodges et al., 2020). Despite challenges in terms of access and quality, online learning platforms have helped maintain educational continuity and provide flexibility for students with varying situations.

In addition, the use of technology has also opened up opportunities for personalized learning and a more inclusive pedagogical approach. By utilizing artificial intelligence (AI) and learning analytics, educators can customize teaching strategies and learning materials according to each student's learning style, interests and abilities (Pardo et al., 2019; Zawacki-Richter et al., 2022). This enables education that is more responsive to students' individual needs. Thus, technology serves not only as a learning aid, but also as a driver of change in educational practices. The ability to analyze student learning data in real-time opens up opportunities for educators to provide faster and more accurate feedback. Finally, the personalization and inclusiveness that these technologies bring can increase student engagement and motivation, creating a more effective and enjoyable learning environment.

However, it is important to note that technology integration in education is not without its challenges. Issues such as the digital divide, lack of teacher training, and data privacy concerns have become major concerns in the literature (Henrie et al., 2020; U. G. Sahoo et al., 2021). Therefore, a comprehensive and holistic approach is needed to ensure that technology truly contributes to inclusion and equity in education. In an effort to address this challenge, recent research has emphasized the importance of building digital literacy among educators and students. Digital literacy refers to the ability to access, evaluate and utilize technology effectively and responsibly (Vuorikari et al., 2022). By improving digital literacy, educators and students can optimize the use of technology in the learning process and ensure that it is used inclusively and ethically. In addition, collaboration between various stakeholders, such as governments, educational institutions, non-profit organizations and the technology industry, plays a key role in promoting inclusion through technology. These partnerships can facilitate resource sharing, curriculum development, and teacher training to suit the specific needs of each community (Griful-Freixenet et al., 2020; Sánchez-Riera et al., 2021).

In a broader scope, the development and implementation of policies that support the use of technology for educational inclusion are also crucial. These policies may include accessibility standards, technology access equity initiatives and ethical guidelines for technology use in education (Kozma, 2022; Taddeo & Floridi, 2023). With a solid policy framework in place, efforts to promote inclusion through technology can be more coordinated and effective. This will ensure that all students, including those from marginalized groups, have equal opportunities to access quality education. In addition, clear and firm policies can

help address the digital divide that exists in society. Ultimately, the purposeful and ethical use of technology in education will contribute to a more inclusive and equitable learning environment for all.

Despite the challenges, empirical evidence from various case studies shows that technology can have a positive impact on educational inclusion when implemented appropriately. For example, research in several European countries revealed that the use of assistive technology can improve participation and academic achievement for students with disabilities (Miesenberger et al., 2020; Scherer et al., 2021), Studies in Latin America show how technology-based distance learning has helped reach populations in remote areas and facilitated access to education for students from disadvantaged backgrounds (Cobo et al., 2020; Oliveira et al., 2022). This evidence demonstrates the potential of technology in overcoming geographical and socio-economic barriers to inclusive education. Technology integration in education can reduce the digital divide and provide more equitable learning opportunities. The right implementation of technology can also support teachers in providing more personalized and adaptive learning according to students' needs. Therefore, it is important for policymakers and educators to continue exploring and optimizing the use of technology to achieve better educational inclusion. However, it is important to remember that technology is not a silver bullet for all challenges in inclusive education. Its application must be done carefully and combined with strong pedagogical strategies, adequate resources and a deep understanding of the local context. In addition, active engagement from students, parents and communities is also crucial to ensure that the technology is truly aligned with their needs and values (McGrath et al., 2021; Traxler & Vosloo, 2023).

In this literature review, we will explore different aspects of using technology to promote inclusion in educational settings. By analyzing recent studies and best practices, it seeks to provide a comprehensive insight into the opportunities, challenges and important factors that should be considered in the guest for a more inclusive and equitable education for all. This research is particularly important due to the growing need for fair and equitable educational inclusion around the world. With technology constantly evolving, a deeper understanding of how technology can be effectively integrated into education systems to support inclusivity is crucial. Without clear, evidence-based quidance, many schools and educational institutions may struggle to implement truly inclusive technology solutions. Therefore, this research can provide important insights for educators, policymakers and other stakeholders to better design and implement technologies that support inclusion. In addition, this research is also urgent due to the wide digital divide between different socio-economic and geographical groups. Students in remote areas or from low-income families often do not have adequate access to technology that can support their learning. By exploring how technology can be implemented to overcome these barriers, this research can provide practical and effective solutions to bridge the gap. This is crucial to ensure that all students, regardless of their background, have equal opportunities for quality education.

Another urgency comes from the drastic changes caused by the COVID-19 pandemic, which forced many educational institutions to shift to online learning. This situation highlights the importance of technological readiness and adaptability in the education system. This research will provide a deeper understanding of how technology can be optimized in crisis situations as well as long-term strategies to improve educational inclusion through technology. Thus, this research is not only relevant for the current situation but also important for future planning in creating a more resilient and inclusive educational environment. Finally, this research is important to guide the development of policies that can support the use of technology in inclusive education. By providing empirical data and in-depth analysis, this research can help policymakers formulate strategies that are more effective and responsive to the needs of inclusive education. Evidence-based policies will be better able to direct resources efficiently and ensure that the implementation of technology in education can provide maximum benefits for all students. The urgency of this research therefore lies in its potential

to bring about real and positive change in educational practices and policies across a range of global contexts.

### **METHOD**

This study employs a literature review approach to explore the role of technology in promoting educational inclusion. A literature review is a systematic and rigorous method for identifying, evaluating, and synthesizing existing research on a specific topic, allowing researchers to gain a comprehensive understanding of the subject matter (Snyder, 2019). By collecting and analyzing previous studies, this literature review aims to provide a thorough overview of the opportunities, challenges, and best practices associated with integrating technology to support inclusive education. The primary data sources for this literature review include scientific journal articles, books, research reports, and other academic publications relevant to the topic. The literature search process will be conducted systematically using reputable academic databases such as Web of Science, Scopus, ERIC, and Google Scholar. These databases are widely recognized for their extensive coverage of peer-reviewed literature and their reliability in academic research (Falagas et al., 2008). Keywords for the search will include combinations of terms such as "educational technology," "educational inclusion," "assistive technology," "distance learning," "learning analytics," and other related concepts. To ensure a comprehensive search, cross-references from the articles identified will also be examined to locate additional relevant sources.

Following the search, the next step involves the selection and critical evaluation of the identified literature. Inclusion criteria will be applied to ensure that only high-quality studies directly relevant to the research topic are incorporated into the review. These criteria may include the relevance of the study to the research questions, the methodological rigor of the research, and the credibility of the sources. The selected literature will then undergo a process of data extraction, where key information will be collected, analyzed, and synthesized to identify major themes, patterns, and gaps in the existing research. This systematic approach will enable the researcher to generate new insights and formulate recommendations that can inform the practice and policy of inclusive education through the use of technology. By identifying and analyzing the key factors that influence the successful integration of technology in inclusive education, the study aims to contribute to the ongoing discourse on how educational technologies can be leveraged to create more equitable learning environments (Booth et al., 2016; Okoli, 2015).

# **RESULT AND DISCUSSION**

# **Evaluation of Positive Impacts and Challenges of Technology Integration in Inclusive Learning**

In an era where technology is increasingly integrating itself into every aspect of life, including education, it is important to recognize the significant role of technology in promoting inclusion in the education system. Research results show that technology integration has had a significant positive impact in improving educational accessibility for students with special needs. The use of assistive technologies such as screen reader software, alternative keyboards and mobility aids has helped reduce the barriers faced by students with disabilities in accessing learning materials and actively participating in learning activities (Alnahdi, 2020; Gokool-Baurhoo & Mbera, 2023). Studies in several European countries reveal that assistive technology not only improves access, but also promotes better academic performance among students with disabilities (Miesenberger et al., 2020). In this context, it is important to explore how technology can be an effective tool in achieving greater educational inclusion, and how continued research and careful implementation can optimize its benefits for students with special needs.

In addition, technology integration has also enabled more effective personalization of learning in inclusive environments. By utilizing artificial intelligence (AI) and learning analytics,

educators can customize teaching strategies and learning materials according to each student's learning style, interests and abilities (Pardo et al., 2019; Zawacki-Richter et al., 2022). This enables education that is more responsive to students' individual needs, thus increasing their learning engagement and motivation. Technology has opened the door for more personalized and inclusive learning, allowing teachers to customize methods and materials according to each student's needs and preferences. Artificial intelligence and learning analytics help in understanding students' learning styles, interests and potentials more deeply, resulting in more effective and engaging learning experiences (Mujiono, 2023). This approach not only increases student engagement, but also boosts their motivation in the learning process.

Another positive impact identified is increased student engagement and participation in the learning process. The use of interactive technologies such as online learning platforms, gamification applications and virtual simulations has been proven effective in attracting interest and encouraging active participation of students, including those who previously had difficulty in following traditional learning (Basilaia & Kvavadze, 2020; Hodges et al., 2020). This is crucial in creating an inclusive and enjoyable learning environment for all students. Thus, the integration of interactive technologies in learning has brought significant positive impacts, especially in improving student engagement and encouraging active participation. Technologies such as online learning platforms, gamification apps, and virtual simulations prove their effectiveness in creating an inclusive and enjoyable learning environment for students, including those who previously experienced difficulties in traditional learning. As such, the use of these technologies is key to creating a more dynamic and effective learning experience for all students.

However, the evaluation also revealed significant challenges in effectively integrating technology in inclusive learning. One of the main challenges is the lack of adequate technology infrastructure in many educational institutions, especially in resource-limited areas (Henrie et al., 2020; U. G. Sahoo et al., 2021). Limited access to hardware, reliable internet connections and digital resources can limit the effective use of technology in supporting educational inclusion. Nonetheless, the evaluation confirmed that the challenges of technology integration in inclusive learning are still significant. Inadequate technology infrastructure, especially in resource-limited areas, is a major barrier. Limited access to hardware, unstable internet connections and a lack of digital resources can hinder the effective use of technology to support educational inclusion. This points to the need for serious efforts to improve technology infrastructure in educational institutions so that inclusive learning can be realized more optimally.

Another challenge identified is the need for continuous training for educators in using technology effectively in inclusive teaching. Many teachers still lack confidence and skill in integrating technology into their teaching practices (Vuorikari et al., 2022). This may hinder the potential of technology in supporting inclusion and personalization of learning. Therefore, investment in teacher training and professional development in technology is crucial to ensure inclusion and personalized learning success. A holistic and sustainable strategy is needed to improve teachers' skills in integrating technology, including direct support, easily accessible resources and regular evaluation. Through collaborative efforts and awareness of these challenges, a learning environment that is inclusive, responsive to student needs and constantly adapting to technological developments can be created.

In addition, the evaluation also found that there is sometimes a gap between the technology offered and the specific needs of students with special needs. Some technologies may not be flexible or customizable enough to accommodate diversity in student learning styles, abilities and preferences (McGrath et al., 2021). This can limit the effectiveness of technology in supporting inclusion and cause frustration for students and educators. Another challenge identified is the issue of data privacy and ethics in the use of educational technology. With the increasing use of online learning platforms, learning analytics, and technologies that collect student data, concerns have been raised regarding privacy protection and data security

(U. G. Sahoo et al., 2021; Taddeo & Floridi, 2023). Clear policies and guidelines are needed to ensure that student data is managed securely and used ethically, while respecting their privacy rights.

While these challenges are significant, research also reveals strategies and best practices that can help overcome these barriers. One of these is through strong collaboration between various stakeholders, such as governments, educational institutions, non-profit organizations and the technology industry (Griful-Freixenet et al., 2020; Sánchez-Riera et al., 2021). These partnerships can facilitate resource sharing, curriculum development and teacher training to suit the specific needs of each community. Strong collaboration between various stakeholders such as governments, educational institutions, non-profit organizations and the technology industry has proven to be an effective strategy in addressing challenges in education. With these solid partnerships, resources can be shared efficiently, curricula can be better developed, and teachers can receive training that suits the specific needs of their communities. In this joint effort, research shows that coordinated and sustained cooperation can be a strong foundation for improving the quality of education at various levels. Thus, through synergy between the various parties involved, challenges in education can be addressed more effectively, providing long-term benefits for the overall development of society and the economy.

In addition, the development and implementation of policies that support the use of technology for educational inclusion is also very important. These policies may include accessibility standards, technology access equity initiatives and ethical guidelines for the use of technology in education (Kozma, 2022). With a solid policy framework in place, efforts to integrate technology in inclusive learning can be more coordinated and effective. Furthermore, research emphasizes the importance of improving digital literacy among educators and students. Digital literacy refers to the ability to access, evaluate and utilize technology effectively and responsibly (Vuorikari et al., 2022). By building strong digital literacy, educators and students can optimize the use of technology in the learning process and ensure that it is used inclusively and ethically.

Finally, the evaluation also highlighted the need for a holistic and contextual approach to integrating technology into inclusive learning. Each educational context has unique needs, resources and challenges. Therefore, the technology solutions implemented should be tailored to the local context and involve active participation from students, parents and communities. By considering these contextual factors, technology can be optimally utilized to support meaningful and sustainable educational inclusion. Overall, this evaluation shows that technology integration in inclusive learning has great and positive potential to improve accessibility, personalization and student engagement. However, to realize these benefits, challenges such as adequate infrastructure, teacher training, technology suitability, data privacy and supportive policies must be addressed with comprehensive and collaborative strategies.

# **Technology-based Inclusive Education Model for the Future**

The rapid development of technology has opened up new opportunities in creating a more adaptive and responsive model of inclusive education. Research results show that the integration of technologies such as artificial intelligence (AI) and learning analytics can facilitate learning that is more personalized and tailored to the needs of individual students (Pardo et al., 2019; Zawacki-Richter et al., 2022). With the ability to analyze student learning data in real-time, educators can provide more accurate and timely feedback and learning adjustments. This development not only improves learning effectiveness but also enables greater inclusion for students with special needs. As such, technology can act as a catalyst in creating a more equitable and just learning environment. Therefore, the application of technology in education is no longer an option, but a necessity to ensure that every student gets the best opportunity to reach his or her potential.

The use of assistive technologies such as screen reader software, alternative keyboards and mobility aids has been proven effective in improving educational accessibility for students with disabilities (Alnahdi, 2020; Gokool-Baurhoo & Mbera, 2023). Future inclusive education models should systematically integrate these assistive technologies to ensure that all students, regardless of their abilities, can participate fully in the learning process. The integration of assistive technologies not only facilitates more inclusive learning but also promotes independence and confidence in students with disabilities. Furthermore, it can reduce educational disparities and provide equal opportunities for all students. Therefore, it is important for educational institutions to adopt a proactive approach in implementing assistive technology, in order to create a truly inclusive and supportive learning environment.

However, a key challenge to overcome is ensuring equitable access to educational technology for all students, regardless of their socio-economic background or geographical location. Research shows that the digital divide is still a significant problem, especially in resource-constrained areas (Henrie et al., 2020; U. G. Sahoo et al., 2021). Future inclusive education models should include strategies to bridge this gap, such as through investment in adequate technology infrastructure and access equity initiatives. This is important to ensure that every student, regardless of socio-economic background, has an equal opportunity to succeed. Thus, inclusive education will be able to create a fair and equitable learning environment for all learners. Ultimately, investments in technology and equitable access will not only improve the quality of education but also promote social justice and sustainable development in society.

In addition, this model should also consider the challenges related to data privacy and ethics in the use of educational technology. With the increasing collection and analysis of student data through online learning platforms and learning analytics, strict policies and guidelines are needed to protect data privacy and security (U. G. Sahoo et al., 2021; Taddeo & Floridi, 2023). Future inclusive education models should prioritize transparency, accountability and respect for students' privacy rights in the implementation of technology. It is important for every educational institution to ensure that student data is used ethically and securely, and provide clear and open access to information to all relevant parties. In addition, the active involvement of students, parents and educators in the technology decision-making process will strengthen trust and cooperation. Thus, a fair and balanced learning environment can be created, supporting the optimal development of each individual without compromising their privacy.

To meet this challenge, collaboration between various stakeholders, such as governments, educational institutions, non-profit organizations, and the technology industry, is crucial (Griful-Freixenet et al., 2020; Sánchez-Riera et al., 2021). These partnerships can facilitate the development of curricula, teacher training and policies that suit the specific needs of each community in integrating technology for inclusive education. Thus, every student can gain access to equal and quality education, regardless of their background or abilities. In addition, collaboration between various parties in this partnership will encourage innovation and renewal of teaching methods that are more adaptive and responsive to technological developments. Ultimately, this will create a more dynamic and inclusive learning environment, where every individual has an equal opportunity to develop and achieve their optimal potential.

One of the key components in a technology-based inclusive education model for the future is the effective utilization of artificial intelligence (AI) and learning analytics. These technologies enable more precise personalization of learning, where teaching materials and strategies can be dynamically adjusted based on student learning data (Pardo et al., 2019; Zawacki-Richter et al., 2022). This can increase student engagement and motivation to learn, as well as ensure that each individual gets support that suits their needs. However, it is important to note that the use of AI and learning analytics in inclusive education should be based on the principles of ethics and equity. The algorithms used should be carefully designed to avoid bias and discrimination against certain groups (Taddeo & Floridi, 2023). In addition,

transparency in the use of data and algorithms is also crucial for building trust and accountability. Thus, the application of AI and learning analytics in inclusive education can provide significant benefits if implemented wisely. It is important for developers and educators to continuously evaluate and refine these technologies to ensure that all students get equal opportunities. Only with an approach grounded in ethics and equity can technology truly support effective and equitable inclusive education.

In addition to AI and learning analytics, future inclusive education models should also explore the potential of new technologies such as virtual reality (VR) and augmented reality (AR). These technologies can be utilized to create immersive and interactive learning environments, and enrich learning experiences for students with varying abilities (Radianti et al., 2020). For example, students with physical disabilities can participate in virtual laboratory simulations or explore natural environments that are difficult to access in person. In addition, future inclusive education models should also promote strong digital literacy among educators and students. Digital literacy refers to the ability to access, evaluate and utilize technology effectively and responsibly (Vuorikari et al., 2022). By building strong digital literacy, educators and students can optimize the use of technology in the learning process and ensure that it is used inclusively and ethically. Good digital literacy enables educators and students to access, evaluate and create digital content effectively, improving the quality of learning and engagement. In addition, a deep understanding of digital literacy helps to reduce the technology gap, ensuring all students have an equal opportunity to succeed. As such, digital literacy not only enriches learning experiences but also prepares young people to participate actively and responsibly in a digital society.

Furthermore, this model should also consider the importance of active involvement of students, parents and communities in the design and implementation process of educational technology. Their participation can ensure that the technology used is aligned with local needs, values and contexts (Traxler & Vosloo, 2023). The technology-based inclusive education model not only benefits students with special needs but also encourages active involvement from teachers, parents and the community as a whole. By involving the perspectives of all stakeholders, this model can be more effective in promoting equality, creating a welcoming learning environment and preparing students to face global challenges in the digital age. In conclusion, inclusive education that combines technology with various perspectives will have a positive and sustainable impact on all parties involved in the learning process. Overall, a technology-based inclusive education model for the future should be holistic, adaptive and oriented towards the individual needs of students. By utilizing technologies such as AI, learning analytics, virtual reality/augmentation and assistive technology, this model has the potential to create a more personalized, immersive and accessible learning environment for all students. However, its implementation must be based on the principles of ethics, fairness, data privacy, and active engagement from all stakeholders to ensure sustainability and maximum positive impact.

# **CONCLUSION**

From this extensive literature review, it can be concluded that the integration of technology in inclusive education has a significant positive impact. The use of assistive technologies such as screen reader software and mobility aids has helped reduce access barriers for students with special needs, while artificial intelligence (AI) and learning analytics enable more effective personalization of learning. In addition, interactive technologies such as online platforms and gamification apps increase student engagement and participation. However, the challenges of technology infrastructure, teacher training, technology appropriateness, data privacy and supportive policies must be addressed to maximize the benefits of these technologies in supporting educational inclusion. Strategic measures are needed to promote inclusion through technology. These include investing in adequate technology infrastructure, continuous training for educators in integrating technology

effectively, and developing policies that support data privacy and technology accessibility. Active collaboration between governments, educational institutions, non-profit organizations, and the technology industry is also key in addressing challenges and ensuring that technology is used ethically and inclusively. With a holistic, adaptive and individual needs-oriented approach, technology-based inclusive education models can create a more personalized, accessible and equitable learning environment, supporting equal access and opportunity for all students.

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