

## Perspective of Children with Disabilities as the Implementation of AI in School: Focus Study in Philippines, Malaysia, and Indonesia

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Article Info	Abstract	
<b>Article History</b> Received: July 2024 Revised: July 2025 Published: September 2025	<p>This study explores the perspectives of students with disabilities on the implementation of Artificial Intelligence (AI) in schools across Philippines, Malaysia, and Indonesia. AI is increasingly recognized for its transformative potential in education, particularly in fostering inclusivity through personalized learning, improved accessibility, and enhanced engagement. A qualitative approach, combined with a literature review, was employed to analyze existing research and identify regional differences in AI implementation. Results indicate that AI tools, such as adaptive learning platforms and assistive technologies, significantly benefit students by addressing individual learning needs and overcoming traditional barriers. However, challenges persist, including inadequate infrastructure, insufficient teacher training, and concerns over data privacy and ethical use of sensitive student information. These obstacles are particularly pronounced in rural and underserved areas, highlighting the need for targeted investments and policy reforms. The study recommends prioritizing infrastructure development, implementing comprehensive training programs for educators, and establishing robust ethical frameworks to ensure responsible AI usage. By addressing these challenges and fostering regional collaboration, AI can become a powerful tool for promoting equity and accessibility in education, ultimately enhancing learning outcomes for students with disabilities. Future research should focus on longitudinal studies and firsthand data collection to better understand AI's long-term impact and refine inclusive educational practices.</p>	
<b>Keywords</b> Artificial Intelligence; Inclusive Learning; Students with Disabilities; Personalized Education; Accessibility in Education		
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## INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative force across various sectors, with education being one of the most promising fields of application. Defined as the creation of computer systems capable of performing tasks typically requiring human intelligence, such as reasoning, problem-solving, and learning, AI has introduced innovative solutions to address challenges in education. Central to AI's functionality is machine learning, a branch of AI that empowers systems to recognize patterns, analyze data, and make informed predictions. The integration of such capabilities in education has revolutionized the learning landscape, particularly for students with disabilities, by fostering inclusivity and accessibility.

One of the most significant contributions of AI in education lies in its ability to personalize learning experiences. Traditional education systems often adopt a one-size-fits-all approach, which can inadvertently marginalize students with unique needs, particularly those with disabilities. By leveraging AI, educators can provide tailored educational content and interventions. AI algorithms analyze student performance data to identify individual learning gaps, enabling the delivery of customized resources that align with students' learning styles and paces (Göçen & Aydemir, 2020; Pua et al., 2021). This capability is transformative for students with disabilities who frequently require specialized support to overcome educational barriers. For example, AI-driven tools can adapt instructional materials in real-time, ensuring that students receive content that is both accessible and effective (Rapti, 2023; Fahimirad & Kotamjani, 2018).

AI also plays a crucial role in enhancing accessibility for students with disabilities. Technologies such as speech recognition and natural language processing have opened new avenues for communication and interaction in educational settings. Text-to-speech applications enable visually impaired students to access written materials, while predictive text and speech synthesis technologies provide communication tools for students with speech impairments (Rapti, 2023). By addressing these fundamental accessibility challenges, AI fosters a more inclusive learning environment where students with disabilities can participate more actively in academic activities. These advancements demonstrate the potential of AI to empower students, promoting equity and participation in educational systems that have historically struggled to meet the needs of all learners.

Moreover, AI alleviates the workload of educators, allowing them to focus more on engaging with students directly. Administrative tasks, such as grading and attendance management, are increasingly being automated by AI systems (Guan, 2023; Wahjusaputri et al., 2023). This automation not only reduces the burden on teachers but also improves efficiency, enabling educators to dedicate more time and energy to personalized instruction and support for students with disabilities. Such integration can significantly enhance the quality of teaching, particularly in inclusive education settings where teachers must address a diverse range of needs and abilities.

Despite these promising developments, the ethical dimensions of AI in education cannot be overlooked. As AI becomes more prevalent, concerns about data privacy, security,

and algorithmic transparency have surfaced. It is essential to ensure that the adoption of AI adheres to ethical guidelines that safeguard student data and promote responsible usage (Makarenko, 2024; Çayır, 2023). Furthermore, the successful integration of AI into education requires that educators be equipped with the necessary skills and knowledge. Professional development and training are crucial to ensure that teachers can effectively use AI tools and maximize their potential to benefit students with disabilities (Makarenko, 2024; Wahjusaputri et al., 2023). These considerations highlight the importance of a balanced approach to AI integration—one that prioritizes both innovation and ethical responsibility.

The current study focuses on understanding the perspectives of students with disabilities regarding AI usage in schools across three Southeast Asian countries: Malaysia, the Philippines, and Indonesia. These countries offer diverse educational contexts and approaches to inclusive education, providing a unique opportunity to compare and analyze the implementation of AI. By capturing the viewpoints of students with disabilities, the study aims to uncover both the advantages and challenges of using AI in these settings. This comparative analysis is expected to yield valuable insights into how cultural, infrastructural, and policy differences influence the experiences of students with disabilities when interacting with AI technologies.

Understanding the perspectives of children with disabilities is critical, as they often face unique challenges in educational settings. AI offers the potential to address many of these challenges by providing tools and resources that support learning and accessibility. However, the effectiveness of these technologies depends largely on how they are perceived and utilized by the students themselves. By exploring their attitudes, experiences, and suggestions, this study seeks to identify the factors that contribute to successful AI integration in inclusive education. The insights gained will serve as a foundation for developing AI-powered educational frameworks that are equitable, supportive, and responsive to the diverse needs of students with disabilities.

Furthermore, this study aims to bridge the gap between technological innovation and educational practice. While AI has demonstrated significant potential in education, its implementation often varies widely depending on local contexts. In Malaysia, for example, policies emphasizing technological advancement in education have paved the way for AI integration, particularly in urban schools. In contrast, the Philippines faces challenges related to digital infrastructure and resource allocation, which can affect the accessibility and effectiveness of AI tools. Meanwhile, Indonesia's approach to inclusive education highlights the importance of community involvement and cultural sensitivity. By comparing these contexts, the study seeks to identify best practices and strategies that can be adapted to different settings, ultimately enhancing the learning outcomes for students with disabilities.

The findings of this study will provide valuable guidance for educators, policymakers, and technologists in shaping inclusive AI strategies. By understanding the experiences and needs of students with disabilities, stakeholders can design AI tools and frameworks that promote accessibility, equity, and inclusion. For example, data-driven insights into student

performance can inform the development of adaptive learning platforms that cater specifically to the needs of children with disabilities. Additionally, the study's findings can inform teacher training programs, ensuring that educators are well-prepared to integrate AI into their teaching practices effectively.

In conclusion, AI holds immense potential to transform education for students with disabilities by addressing accessibility challenges, personalizing learning experiences, and reducing teacher workload. However, realizing this potential requires a nuanced understanding of the perspectives and experiences of students with disabilities. By focusing on the viewpoints of children in Malaysia, the Philippines, and Indonesia, this study aims to contribute to the development of inclusive AI frameworks that enhance educational opportunities for all. Through a combination of technological innovation, ethical responsibility, and cultural sensitivity, AI can become a powerful tool for promoting equity and inclusion in education.

### **Study Problems and Objectives**

The integration of Artificial Intelligence (AI) into education has brought significant advancements, particularly in creating accessible and inclusive learning environments for students with disabilities. However, challenges remain in understanding how these technologies are perceived by their primary beneficiaries—students with disabilities. While AI is lauded for its ability to personalize learning, enhance accessibility, and reduce the workload of educators, there is limited research on how students with disabilities experience and interact with these systems. Existing studies often focus on the technical capabilities of AI or its broad educational impacts, neglecting the specific needs, perceptions, and experiences of students with disabilities in different socio-cultural contexts. This gap in research raises critical questions about the effectiveness and inclusiveness of AI-powered educational tools in addressing the unique barriers faced by these students.

Furthermore, the diversity in educational policies, infrastructure, and cultural attitudes across countries adds complexity to the adoption of AI in schools. In Southeast Asia, countries like Malaysia, the Philippines, and Indonesia exhibit varied approaches to inclusive education, influenced by differences in technological readiness, resource allocation, and societal perspectives on disability. These contextual differences make it challenging to establish universal strategies for implementing AI in education. For example, while Malaysia may have advanced technological resources and policy frameworks, the Philippines and Indonesia might face infrastructural limitations or cultural barriers that hinder effective AI integration. Thus, a comparative analysis is needed to identify commonalities and differences in how students with disabilities perceive and experience AI in these countries, shedding light on the factors that influence the success or limitations of AI integration in diverse settings.

This study aims to explore and compare the viewpoints of students with disabilities on the use of AI in schools across Malaysia, the Philippines, and Indonesia. By focusing on their unique perspectives, the research seeks to uncover the benefits and challenges associated with AI-powered educational tools as perceived by the students themselves. Understanding these

perspectives is critical for evaluating how well these technologies address the specific needs of students with disabilities and for identifying areas where improvements are necessary. This objective aligns with the broader goal of fostering inclusive and equitable education systems that leverage AI to support diverse learners effectively.

Additionally, the study intends to examine how contextual factors such as policies, infrastructure, and cultural attitudes impact the adoption and effectiveness of AI in schools for students with disabilities. By analyzing the similarities and differences among the three countries, the research will provide insights into best practices and potential challenges in implementing AI in diverse educational environments. These findings will not only inform policymakers and educators but also contribute to the design of AI systems that are adaptable, inclusive, and sensitive to the unique socio-cultural contexts in which they are deployed. The ultimate goal is to develop actionable recommendations that promote the equitable use of AI in education, ensuring that its transformative potential benefits all students, particularly those with disabilities.

### **Novelty of Study**

The novelty of this study lies in its focus on the perspectives of students with disabilities regarding the use of Artificial Intelligence (AI) in schools, specifically in the unique contexts of three Southeast Asian countries: Malaysia, the Philippines, and Indonesia. While existing research has largely centered on the technological advancements and broad educational impacts of AI, this study prioritizes the voices and experiences of a marginalized group whose needs are often overlooked in the design and implementation of educational technologies. By capturing these insights, the study addresses a critical gap in the literature, offering a nuanced understanding of how AI impacts students with disabilities in diverse socio-cultural and educational settings.

Moreover, this study provides a comparative analysis across three countries with varying levels of technological infrastructure, policy frameworks, and cultural attitudes toward disability and inclusive education. This cross-national perspective is a novel approach, as much of the existing research on AI in education tends to focus on single-country contexts or generalized findings that lack cultural specificity. By highlighting the similarities and differences in students' experiences and perceptions, the research contributes to a deeper understanding of how localized factors influence the adoption and effectiveness of AI in inclusive education.

Another innovative aspect of this study is its aim to bridge the gap between technological capabilities and the practical realities of inclusive education. The study not only explores the benefits and challenges of AI as perceived by students with disabilities but also considers the ethical and contextual factors that shape their experiences. This dual focus ensures that the findings are both practically relevant and aligned with the broader goal of equitable AI integration in education. By addressing these interconnected dimensions, the research advances the discourse on how AI can be designed and implemented to better meet the needs of all learners.



## METHOD

### General Background

This research employed a qualitative approach combined with a literature review to explore and compare the perspectives of students with disabilities on the use of Artificial Intelligence (AI) in schools across Malaysia, the Philippines, and Indonesia. Qualitative research was chosen for its ability to delve into the nuanced and contextualized experiences of individuals. Qualitative research emphasizes the interpretation of phenomena, prioritizing meaning over generalization, with the researcher acting as the primary instrument for data collection and analysis. By utilizing a well-structured literature review as a key method, the study synthesized insights from existing scholarly works, official reports, books, and other relevant sources, providing a comprehensive understanding of the subject.

The literature review process followed the framework suggested by Snyder (2019), which outlines how a systematic review can enhance knowledge development, inform policy and practice, provide evidence of effects, and inspire new ideas within a field. This approach was critical in addressing the study's objectives, particularly in examining the diverse contexts of AI implementation in inclusive education in Southeast Asia. To ensure the reliability and depth of the analysis, data were sourced from reputable academic databases, journals, government publications, books, and credible news outlets.

The study's thematic analysis was conducted using content analysis, a method for classifying and interpreting data into relevant themes (Kraus et al., 2022). Thematic analysis allowed the researchers to identify patterns and insights related to the experiences, challenges, and perceptions of students with disabilities in their interactions with AI technologies. By integrating qualitative insights with literature-based evidence, this method provided a structured and detailed understanding of the research problem.

### Research Phases

The methodology was carried out in four interconnected phases (see Figure 1) to ensure thoroughness and rigor in addressing the research objectives.

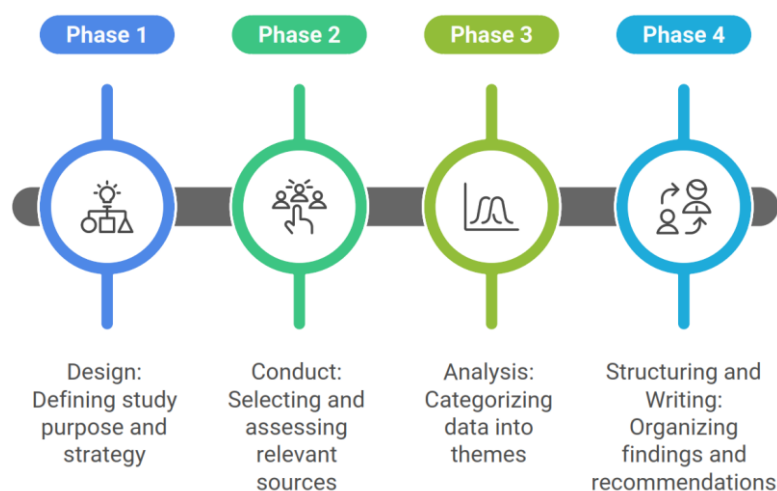


Figure 1. Research phases

### ***Phase 1: Design***

The initial phase focused on defining the study's specific purpose, identifying the scope, and formulating a systematic strategy for data collection. The primary objective was to investigate and compare the viewpoints of students with disabilities regarding AI usage in schools across Malaysia, the Philippines, and Indonesia. To achieve this, a comprehensive search strategy was developed to gather relevant literature from diverse sources, including academic journals, books, government reports, and credible news outlets.

Key search terms and phrases, such as "AI in education," "inclusive education technology," and "students with disabilities in Southeast Asia," were identified to guide the search process. Priority was given to reputable academic databases like Scopus, PubMed, and Google Scholar, as well as local sources providing insights into country-specific contexts. The inclusion criteria emphasized publications from the last decade, ensuring that the research incorporated the most recent developments and trends in AI and inclusive education. This phase also involved outlining the methods for evaluating the quality and relevance of selected sources, ensuring that only high-quality studies aligned with the study objectives were included.

### ***Phase 2: Conduct***

The second phase involved systematically selecting, documenting, and assessing relevant articles and sources. Initial searches yielded a wide range of publications, which were then screened for relevance and quality based on the inclusion criteria. Duplicates were removed, and abstracts were reviewed to ensure alignment with the research questions. A detailed documentation process was maintained to record bibliographic information, methodological approaches, and key findings from each selected source.

Each selected source underwent a rigorous assessment to ensure reliability and credibility. Studies were evaluated based on their methodological rigor, theoretical contributions, and relevance to the study's objectives. For instance, studies detailing the implementation of AI in inclusive education or discussing the unique challenges faced by students with disabilities in Malaysia, the Philippines, and Indonesia were given particular attention.

### ***Phase 3: Analysis***

Content analysis was employed to categorize and abstract data into themes that aligned with the research objectives. This thematic analysis identified recurring patterns, insights, and divergences in the literature. For example, themes such as "personalized learning," "accessibility challenges," "technological readiness," and "cultural attitudes toward disability" emerged as significant areas of focus.

Data abstraction ensured that key insights from each source were synthesized into cohesive themes. This process involved cross-referencing findings to identify commonalities and differences in the experiences of students with disabilities across the three countries. For instance, while Malaysia demonstrated advanced technological infrastructure supporting AI

adoption, the Philippines highlighted infrastructural challenges, and Indonesia emphasized community-driven approaches to inclusive education.

The thematic analysis also captured the ethical considerations surrounding AI in education, such as data privacy and the transparency of algorithms, which were consistently raised across the literature. This phase ensured that the data addressed the study's objectives and provided a nuanced understanding of how AI influences educational experiences for students with disabilities.

#### ***Phase 4: Structuring and Writing***

The final phase involved organizing and presenting the findings in a structured and coherent format. The report was crafted to clearly communicate the analyzed data, emphasizing key themes and their implications. The challenges and opportunities associated with AI implementation were highlighted, particularly concerning the diverse policy environments, infrastructural realities, and cultural attitudes of the three countries.

This phase also involved synthesizing the findings into actionable insights and recommendations. The structured writing aimed to provide clarity for policymakers, educators, and technologists, emphasizing the importance of adapting AI strategies to local contexts. For instance, the report suggested leveraging Malaysia's technological advancements, addressing the Philippines' infrastructural gaps, and integrating Indonesia's community-driven practices to create more inclusive AI-powered educational frameworks.

#### **Research Validity and Ethical Considerations**

The validity of the research was ensured by employing a systematic and transparent approach to data collection and analysis. Multiple sources were cross-referenced to triangulate findings and minimize biases. Additionally, ethical considerations were addressed by prioritizing studies that adhered to ethical guidelines, particularly regarding the use of data from students with disabilities. The literature review also incorporated discussions on ethical AI implementation, emphasizing the need for data privacy and responsible usage.

This comprehensive methodology enabled the study to provide an in-depth, context-sensitive exploration of the research problem, offering valuable insights into the perspectives of students with disabilities on AI in education within Southeast Asia. The findings are expected to contribute significantly to the discourse on inclusive education and the responsible integration of AI technologies.




### **RESULTS AND DISCUSSION**

The results of this study emphasize the transformative potential of Artificial Intelligence (AI) in fostering inclusive education for students with disabilities across the Philippines, Malaysia, and Indonesia. By examining the positive impacts, challenges, and contextual differences in AI implementation, this discussion provides a nuanced analysis of how AI influences educational experiences for this demographic. Each finding is discussed in detail, supported by specific examples and insights from the reviewed literature.



## Positive Impacts of AI on Children with Disabilities

Students with disabilities in Malaysia, the Philippines, and Indonesia express a range of positive perspectives on AI in education. Many highlight how AI tools, such as adaptive learning platforms and gamified applications, have transformed their learning experiences by catering to their individual needs and enhancing engagement. For instance, students with dyslexia in Malaysia appreciate personalized AI systems that simplify complex materials, while visually impaired students in the Philippines value text-to-speech applications that make reading accessible. Similarly, students in Indonesia report increased motivation and academic confidence due to interactive and gamified AI-based platforms. These tools empower them to learn at their own pace, bridging gaps created by traditional educational methods and fostering inclusivity in classrooms.

Characteristic	Malaysia	Philippines	Indonesia
 <b>Personalized Learning</b>	Tailored content for dyslexia	Enhanced engagement and performance	Adaptive platforms improve engagement
 <b>Improved Accessibility</b>	Speech recognition aids hearing impairments	Text-to-speech for visually impaired students	Text-to-speech improves access for visually impaired
 <b>Enhanced Engagement</b>	Gamified learning enhances concentration	Gamified AI improves focus for ADHD	Interactive platforms increase participation

**Figure 2.** Positive impacts of AI on children with disabilities

### *Personalized Learning*

AI technologies facilitate personalized learning by adapting educational content to individual needs, making education more effective for students with disabilities. Adaptive learning platforms, for instance, analyze student performance and feedback to modify content difficulty and presentation, ensuring alignment with each student's pace and learning style. In the Philippines, the integration of AI-driven personalized learning tools has significantly enhanced engagement and academic performance among students with learning disabilities. For example, research conducted by Cruz (2021) shows that AI-supported interventions foster improved learning outcomes by addressing individual challenges effectively.

In Malaysia, studies highlight the application of machine learning algorithms to tailor content for students with dyslexia. These tools not only enhance comprehension but also

increase motivation and confidence among students, as documented by Hamid et al. (2015). Similarly, in Indonesia, Faresta (2024) reports that AI-based adaptive platforms contribute to better engagement and academic achievements for students with disabilities, creating a more equitable educational environment. These findings illustrate how AI's ability to customize learning experiences supports the academic growth of students who often require additional assistance to overcome learning barriers.

AI-powered tools facilitate personalized learning by adapting educational content to meet individual student needs. For instance, AI can analyze a student's learning patterns and preferences, allowing for tailored instructional materials that cater to their specific challenges and strengths. This personalized approach is particularly beneficial for students with disabilities, as it can help bridge the gap in academic performance compared to their peers without disabilities (Thomas, 2024; Rasheed, 2023). Furthermore, the use of AI in educational contexts has been linked to improved engagement and motivation among students, which is essential for fostering academic success (Lainjo, 2024; Baba, 2024).

Moreover, AI technologies can enhance accessibility in educational settings. For example, AI-driven tools such as speech recognition software, text-to-speech applications, and adaptive learning platforms can provide essential support for students with various disabilities, including visual and auditory impairments (Adeleye, 2024; Sarkar, 2024). These tools not only facilitate easier access to educational materials but also promote independence among students with disabilities, allowing them to engage more fully in their learning experiences. The ability of AI to provide real-time feedback and assistance further empowers students, enabling them to take control of their learning processes (Evmenova, 2024).

### ***Improved Accessibility***

AI-driven assistive technologies play a pivotal role in breaking down physical and cognitive barriers, enabling students with disabilities to access educational materials and participate actively in classroom activities. Technologies such as text-to-speech systems, speech recognition tools, and predictive text solutions have revolutionized accessibility. In the Philippines, text-to-speech applications empower visually impaired students by converting written content into audible formats, allowing them to engage more effectively with learning materials (Reyes, 2021).

In Malaysia, speech recognition tools have been employed to assist students with hearing impairments, facilitating better communication and interaction within classroom settings. Aziz et al. (2011) documented how such tools enhance participation, creating a more inclusive educational environment. Similarly, in Indonesia, text-to-speech systems have improved accessibility for students with visual impairments, ensuring their active engagement with academic resources (Brotosaputro et al., 2024). These technological advancements demonstrate the significant role of AI in enabling students with disabilities to overcome traditional barriers to education, fostering inclusivity.

Speech recognition technology, for instance, allows students with physical disabilities to interact with computers and educational materials without the need for traditional input

devices like keyboards. This is particularly beneficial for students with conditions such as dysarthria, where speech recognition systems can be tailored to recognize their specific speech patterns, thus improving communication and participation in classroom activities (Calvo et al., 2020; Kim et al., 2017). The development of specialized speech recognition systems has shown that they can achieve higher accuracy rates when adapted for individual users, making it easier for students with speech impairments to express themselves and engage with their peers (Calvo et al., 2020; Darabkh et al., 2017; Kim et al., 2017). Moreover, the integration of speech recognition in educational settings has been linked to improved literacy outcomes, as it allows for real-time feedback on pronunciation and language use, fostering a more supportive learning environment (Moxon, 2021).

Text-to-speech (TTS) systems also significantly enhance accessibility for students with reading disabilities, such as dyslexia. These systems convert written text into spoken words, enabling students to access content that they may struggle to read independently. Research indicates that TTS applications can improve comprehension and retention of information, thereby facilitating a more equitable learning experience (Bone & Bouck, 2016; Svensson et al., 2019). The use of TTS tools has been shown to reduce the cognitive load on students with disabilities, allowing them to focus on understanding the material rather than decoding text (Bone & Bouck, 2016; Svensson et al., 2019). Furthermore, TTS systems can be integrated into various learning platforms, making them versatile tools for diverse educational contexts (Svensson et al., 2019).

Additionally, assistive technologies can help bridge communication gaps for students with hearing impairments. For example, systems that combine speech recognition with live video feeds can enable deaf students to participate in discussions by providing real-time transcriptions of spoken content (Alzubaidi & Otoom, 2018). This not only enhances their ability to follow along with classroom discussions but also encourages active participation, thereby fostering a sense of belonging within the classroom community (Alzubaidi & Otoom, 2018). Furthermore, the incorporation of assistive technologies into Individualized Education Plans (IEPs) has been shown to enhance the learning experience and academic outcomes for students with disabilities, ensuring that their unique needs are met effectively (Koch, 2017).

### ***Enhanced Engagement***

AI applications, particularly those incorporating gamification and interactivity, have proven to be highly effective in boosting student engagement. Gamified learning experiences leverage AI to create interactive and enjoyable educational environments, which are especially beneficial for children with disabilities who may find traditional methods less stimulating. In the Philippines, studies by Santos (2021) reveal that gamified AI tools significantly improve focus and academic outcomes for students with ADHD, highlighting the importance of engaging learning platforms tailored to individual needs.

In Malaysia, Fei et al. (2023) document the success of gamified learning in enhancing the concentration and motivation of students with disabilities. Interactive AI-based platforms in Indonesia have similarly yielded positive outcomes, as Restianty et al. (2024) report increased

student participation and enthusiasm. These findings emphasize the critical role of engagement in improving learning experiences and outcomes, showcasing how AI applications can make education more accessible and appealing for students with diverse needs.

Gamification, which involves integrating game-like elements into educational contexts, has been shown to foster motivation and engagement among students. For instance, a study by Dindar et al. (2020) demonstrated that gamified cooperation and competition can invoke high levels of task involvement and lead to similar learning achievements, indicating that both approaches can be equally effective in enhancing motivation. This is particularly relevant for children with disabilities, as gamified learning experiences can provide a more engaging and less intimidating way to approach educational content. By incorporating elements such as rewards, levels, and feedback, gamification can create a sense of accomplishment and encourage persistence in learning tasks (Saputra, 2015; Yu, 2023).




Interactive AI tools also play a significant role in making learning more accessible and enjoyable. For example, AI-driven applications can adapt to the individual needs of students, providing personalized learning experiences that cater to their unique learning styles and preferences (Zdravkova et al., 2022; Zdravkova, 2022). This adaptability is crucial for children with disabilities, as it allows them to engage with content at their own pace and in a manner that suits their abilities. Moreover, the use of AI in educational settings can facilitate the creation of simulated environments, including augmented and virtual reality, which can provide immersive learning experiences that capture students' attention and enhance their understanding of complex concepts (Zdravkova et al., 2022; Žilak et al., 2018).

Additionally, research indicates that gamified learning can lead to improved cognitive outcomes for children with learning disabilities. A study by Shaban et al. found that gamified cognitive training applications significantly enhanced user experience and reduced cognitive load, which is particularly beneficial for students who may struggle with traditional learning methods (Shaban et al., 2021). This finding underscores the potential of gamified learning to not only engage students but also to support their cognitive development in a meaningful way.

### **Challenges in AI Implementation**

Despite the benefits, students with disabilities also highlight several challenges in AI implementation that hinder its potential. In rural areas across the Philippines, Malaysia, and Indonesia, students frequently mention the lack of reliable internet access and outdated technological infrastructure, which limit their ability to fully utilize AI tools. They also express frustration over the scarcity of assistive technologies in their schools, particularly in Indonesia, where many teachers lack the necessary training to support AI integration effectively. Additionally, concerns about data privacy and the ethical use of sensitive personal information are prevalent, especially among students and their families in Malaysia. These challenges underscore the importance of addressing infrastructural deficits, providing

adequate teacher training, and ensuring robust data protection measures to create a more equitable learning environment.

Characteristic	Philippines	Malaysia	Indonesia
 <b>Technological Infrastructure</b>	Inadequate internet, outdated devices	Scarce resources in rural regions	Lack of assistive technologies in schools
 <b>Educator Training</b>	Need skills to adapt AI tools	Training essential for inclusive learning	Collaborative efforts needed for training
 <b>Data Privacy</b>	Apprehension about data collection	Concerns about sensitive information storage	Adherence to data protection regulations

**Figure 3.** Challenges in AI implementation

### *Technological Barriers*

Despite the benefits, the implementation of AI in inclusive education faces significant challenges, particularly related to technological infrastructure. In the Philippines, rural schools often struggle with inadequate internet connectivity and a lack of modern devices, hindering the adoption of AI tools. De-Leon (2020) notes that such infrastructural deficits limit the potential of AI technologies to reach underserved areas, exacerbating educational inequalities.

Similarly, Malaysia faces challenges in rural regions where basic technological resources are scarce. Mastam and Zaharudin (2024) highlight how these limitations prevent the effective deployment of AI tools in schools, creating disparities in access to educational technologies. In Indonesia, the situation is compounded by the lack of assistive technologies in inclusive schools, with 70% of teachers reporting the absence of essential tools. Furthermore, 85% of educators have not received adequate training on using these technologies, as reported by Hata et al. (2023). Teachers often rely on personal resources or low-tech solutions, reflecting minimal governmental support for technological procurement and maintenance. Addressing these technological barriers is critical to ensuring that all students benefit from AI's transformative potential.

Previous study indicates that the absence of disability-friendly infrastructure is a critical barrier to inclusive education. Delubom et al. (2020) highlight that many educational institutions do not have clear plans for revamping their facilities to accommodate students

with disabilities, which reflects a broader trend observed in higher education institutions where physical access remains a challenge. This lack of infrastructure not only affects the physical accessibility of schools but also limits the availability of essential technological resources that could support the learning needs of students with disabilities.

Moreover, the importance of adequate facilities and resources in promoting inclusive education is emphasized by Alvi (2023), who notes that educational units are obligated to provide the necessary equipment and media to optimize learning for all students, including those with disabilities (Alvi, 2023). However, in many rural and underserved areas, these resources are often lacking, which can lead to significant disparities in educational opportunities. The access to assistive technology, such as screen magnification and Braille, is crucial for students with disabilities to effectively engage with educational materials (Lersilp, 2016). Without such technology, students are at a disadvantage, particularly in environments where traditional teaching methods may not meet their needs.

The challenges extend beyond just the physical infrastructure; they also encompass the need for trained educators who can effectively utilize technology in their teaching. The successful integration of AI technologies in education requires not only solid infrastructure but also the presence of knowledgeable educators who can leverage these tools to enhance learning (Lázaro & Duarte, 2023). In rural areas, where professional development opportunities may be limited, this can pose a significant barrier to the effective use of AI in classrooms.

Furthermore, the digital divide is a pressing issue for students with disabilities, as highlighted by Duplaga (2017), who points out that access to the Internet and digital resources is often a matter of social justice and economic equity. This divide is particularly pronounced in rural areas, where infrastructure may be inadequate, further exacerbating the challenges faced by students with disabilities. The lack of access to technology can hinder their ability to participate fully in educational activities and limit their learning outcomes.

### ***Training for Educators***

The effective integration of AI tools into educational practices requires comprehensive training for educators. Without adequate preparation, teachers may struggle to utilize these tools to their full potential, limiting the benefits for students with disabilities. In the Philippines, pilot programs underscore the necessity of teacher training to maximize the effectiveness of AI technologies. Villanueva (2021) emphasizes the importance of equipping educators with the skills needed to adapt AI tools to diverse classroom needs.

In Malaysia, Fei et al. (2023) argue that teacher training is essential for fostering inclusive learning environments. Educators must be proficient in both technological and pedagogical aspects to create tailored learning experiences for students with disabilities. Similarly, in Indonesia, Nuryadin and Marlina (2023) highlight the importance of collaborative efforts between governments, educational institutions, and technology providers to support teacher training initiatives. These efforts aim to bridge the gap between technological advancements and practical applications in classrooms, ensuring that educators are well-equipped to implement AI effectively.



Research has consistently shown that educators' familiarity with technology is crucial for successful implementation. A significant lack of training among primary education teachers regarding the use of information and communication technology (ICT) for students with disabilities hindered effective teaching practices (Batanero et al., 2018). This lack of training can lead to underutilization of available AI tools, which are designed to support diverse learning needs. Teachers' trust in AI-powered educational technology is influenced by their training and professional development, which is essential for effective adoption and integration (Nazaretsky et al., 2022).

The importance of ongoing professional development is further supported by the findings of Wood et al. (2021), who argue that educators must be trained in AI applications to teach best practices effectively (Wood et al., 2021). This principle applies across various educational contexts, including K-12 settings, where teachers need to be equipped with the skills to integrate AI tools into their curricula. The lack of such training can lead to a disconnect between the potential of AI technologies and their actual implementation in classrooms, ultimately affecting the educational experiences of students with disabilities.

Additionally, the rapid evolution of AI technologies necessitates that educators engage in continuous learning to keep pace with advancements. The perceived effectiveness of AI applications in education is closely linked to the support and training provided to educators (Alhumaid et al., 2023). If teachers are not adequately prepared to utilize these tools, the benefits of AI in fostering personalized and adaptive learning environments may not be realized.

### ***Privacy Concerns***

The use of AI in education raises ethical concerns, particularly regarding data privacy and security. These issues are especially pertinent for vulnerable populations such as students with disabilities. In the Philippines, there is widespread apprehension about the collection and use of sensitive student data by AI-driven educational platforms. Mateo (2021) highlights the need for transparent and secure data practices to build trust among stakeholders.

In Malaysia, Lowa (2024) identifies privacy concerns related to the storage and use of sensitive information about students with disabilities. Ethical guidelines emphasizing transparency and data protection are crucial to safeguarding student rights. Similarly, in Indonesia, Syaidina et al. (2024) stress the importance of adhering to data protection regulations and ensuring fairness in AI algorithms to prevent biases. These findings underscore the need for robust ethical frameworks to address privacy concerns and promote responsible AI use in education.

One of the primary concerns surrounding AI in education is the collection and management of sensitive student data. AI systems often require access to vast amounts of personal information to function effectively, including academic performance, behavioral data, and even health-related information for students with disabilities. Huang (2023) emphasizes that the rapid advancement of AI technologies has led to increased public concern regarding ethics, particularly in relation to student privacy and data protection. The potential

for misuse of this data, whether through unauthorized access or inadequate security measures, poses a significant risk, especially for children who may be less able to advocate for themselves.

Additionally, the trust of parents and educators is crucial for the successful implementation of AI tools in education. If stakeholders perceive that their children's data is at risk, they may be reluctant to embrace AI technologies, thereby limiting their potential benefits. Alharbi (2023) highlights the importance of addressing societal aspects, such as equity and learner agency, when integrating AI tools in educational contexts.

### **Regional Variations and Implications**

The integration of Artificial Intelligence (AI) in inclusive education demonstrates varying degrees of development and implementation across the Philippines, Malaysia, and Indonesia. These regional differences provide valuable insights into the contextual factors that influence the success and challenges of AI in addressing the educational needs of students with disabilities.

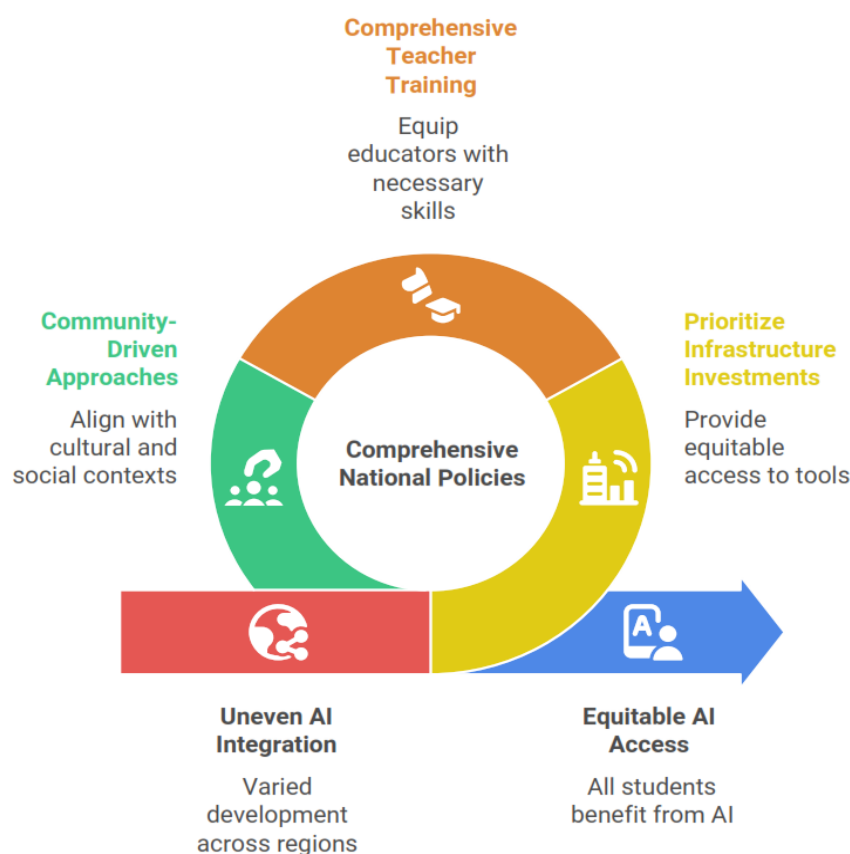
In the Philippines, AI initiatives in education are largely in the pilot phase, focusing on enhancing inclusivity and accessibility. These initiatives aim to leverage AI's potential to address the unique challenges faced by students with disabilities. For example, pilot programs have demonstrated the effectiveness of AI tools in improving educational outcomes for children with learning disabilities, such as through adaptive learning platforms and assistive technologies like text-to-speech systems (Garcia, 2021). Such tools have been instrumental in fostering engagement and accessibility, particularly in urban settings where technological infrastructure is more developed.

Despite these promising outcomes, significant gaps remain in policy and infrastructure development. Rural areas, in particular, face challenges in adopting AI technologies due to insufficient access to reliable internet and modern computing devices (De-Leon, 2020). These disparities highlight the need for comprehensive national policies that prioritize infrastructure investments and provide equitable access to AI tools. Moreover, training educators to utilize these technologies effectively is crucial for ensuring that the benefits observed in pilot programs can be scaled nationwide. As Garcia (2021) points out, while pilot initiatives demonstrate AI's potential, widespread adoption requires a stronger policy framework and strategic investments in technological readiness.

Malaysia has made significant strides in integrating AI into education, with dedicated programs aimed at supporting children with disabilities. The government's investment in technological advancements has paved the way for innovative applications of AI in inclusive education. For instance, machine learning tools are being used to create personalized learning experiences for students with specific learning disabilities, such as dyslexia. These efforts reflect Malaysia's commitment to leveraging AI for educational inclusivity (Hamid et al., 2015).

However, challenges persist in ensuring consistent implementation and evaluation of these programs. While urban schools often benefit from advanced technological resources,

rural areas still lag in terms of infrastructure and access to AI tools. Panjwani-Charania and Zhai (2023) emphasize the importance of bridging this gap to ensure that all students, regardless of their geographical location, can benefit from AI's capabilities. Additionally, teacher training remains a critical issue. Although there are programs designed to familiarize educators with AI technologies, their reach and effectiveness vary. Fei et al. (2023) stress the need for comprehensive and continuous training programs that equip teachers with both technological and pedagogical skills necessary for integrating AI into inclusive education.



**Figure 3.** Integrating AI in inclusive education

To maximize the impact of AI in Malaysia's education system, efforts must focus on scaling successful initiatives, improving rural connectivity, and standardizing teacher training programs. Furthermore, establishing mechanisms to evaluate the outcomes of AI integration will ensure that these technologies are effectively meeting the needs of students with disabilities.

Indonesia's exploration of AI in education is primarily through pilot projects that aim to enhance learning experiences for children with disabilities. These projects highlight the potential of AI to create more inclusive educational environments. For example, adaptive learning platforms and assistive tools, such as text-to-speech systems, have shown promise in addressing the diverse needs of students with disabilities (Faresta, 2024). Initial results suggest that AI technologies can significantly improve engagement and academic

performance, particularly in urban areas where resources are relatively more abundant (Hata et al., 2023).

However, challenges related to infrastructure and educator readiness remain substantial. In rural areas, schools often lack the basic technological resources needed to implement AI tools effectively. Furthermore, the limited availability of assistive technologies and inadequate training for educators exacerbate these challenges. According to Hata et al. (2023), 70% of teachers in inclusive schools report the absence of necessary technologies, and 85% have not received relevant training. This gap in resources and expertise underscores the need for targeted interventions to support the adoption of AI in education.

Indonesia's emphasis on community-driven approaches and cultural sensitivity offers a unique opportunity to address these challenges. By involving local communities in the design and implementation of AI initiatives, policymakers can ensure that these technologies are aligned with the cultural and social contexts of their target audiences. Collaborative efforts between government agencies, educational institutions, and technology providers will be essential for scaling AI adoption and addressing infrastructural and training deficits.

### **Comparative Insights**

The regional differences in AI implementation across the Philippines, Malaysia, and Indonesia underscore the importance of contextual factors in shaping educational outcomes. While the Philippines demonstrates significant promise through its pilot programs, comprehensive policies and infrastructural investments are required to scale these initiatives. Malaysia, with its advanced technological resources, faces the challenge of ensuring equitable access and consistent program implementation, particularly in rural areas. Indonesia, despite its resource limitations, offers valuable lessons in leveraging community-driven approaches and pilot projects to explore AI's potential.

Collectively, these findings emphasize the need for a multi-faceted approach to AI integration in inclusive education. Policymakers must address technological disparities, prioritize educator training, and establish robust mechanisms for evaluating AI's impact. Furthermore, fostering regional collaboration and knowledge-sharing among Southeast Asian nations could accelerate the adoption of best practices and innovative strategies. By addressing these challenges and leveraging regional strengths, AI can become a powerful tool for promoting equity and inclusion in education across diverse contexts.

### **CONCLUSION**

The integration of Artificial Intelligence (AI) into education holds transformative potential, especially for fostering inclusivity and accessibility for students with disabilities. This study underscores the positive impacts of AI, such as personalized learning, improved accessibility, and enhanced engagement, as evidenced in Malaysia, the Philippines, and Indonesia. AI-driven tools, including adaptive learning platforms, text-to-speech applications, and gamified learning environments, have demonstrated their ability to cater to the unique needs of students, empowering them to overcome traditional educational barriers.

These advancements highlight AI's role in creating equitable learning environments, particularly for students with disabilities who require tailored interventions to thrive.

However, this research also identifies significant challenges in AI implementation. Technological barriers, such as inadequate infrastructure and limited internet connectivity in rural areas, hinder the widespread adoption of AI in education. Additionally, insufficient training for educators and concerns about data privacy and ethical use of sensitive student information present obstacles to fully leveraging AI's potential. These challenges vary across regions, influenced by differences in policy, infrastructure, and socio-cultural factors. Despite these hurdles, the findings emphasize the importance of a multi-faceted approach to AI integration that combines technological innovation with ethical considerations and cultural sensitivity. Through targeted investments, robust policies, and collaborative efforts, AI can significantly enhance educational opportunities for all students, especially those with disabilities.

## **LIMITATIONS**

This study primarily relies on qualitative data and literature review methods, which may limit the generalizability of its findings. The reliance on secondary data restricts the ability to capture firsthand perspectives and experiences of students with disabilities. Additionally, the focus on Malaysia, the Philippines, and Indonesia may not fully represent the diversity of challenges and successes experienced in other Southeast Asian countries or global contexts. Variations in the availability and quality of data across the three countries also pose limitations, potentially leading to an uneven analysis of AI implementation.

Another limitation lies in the evolving nature of AI technologies. Rapid advancements in AI tools and applications may render some findings outdated over time. The study also does not extensively address the long-term sustainability of AI integration in education or its broader social implications. Future research incorporating longitudinal studies and direct engagement with stakeholders, including students, educators, and policymakers, would provide a more comprehensive understanding of AI's impact on inclusive education.

## **RECOMMENDATION**

To maximize the benefits of AI in education for students with disabilities, stakeholders should prioritize investments in technological infrastructure, particularly in rural areas, to ensure equitable access to AI tools. Comprehensive teacher training programs must be implemented to enhance educators' technical proficiency and ability to create inclusive learning environments. Additionally, robust ethical guidelines and transparent data protection policies are essential to address privacy concerns and foster trust among all stakeholders. Policymakers should adopt community-driven approaches, involving local voices to ensure AI initiatives are culturally relevant and effective. Collaborative efforts between governments, educators, and technology providers will further enhance the integration of AI, creating a more inclusive and accessible education system.

#### Author Contributions

The authors have sufficiently contributed to the study, and have read and agreed to the published version of the manuscript.

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#### Conflict of Interests

The authors declare no conflict of interest.

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