

## LEVERAGING AI FOR INCLUSIVE EDUCATION: DEVELOPING ADAPTIVE CURRICULUM STRATEGIES FOR ADOLESCENTS WITH ADHD IN NIGERIAN SCHOOLS

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### Abstract

This paper explores how advancements in AI technology can be leveraged to design curricula that suit adolescents with ADHD in Nigerian schools. To this end, the study employed the mixed methods approach to examine the impact of AI on ADHD-friendly curriculum development using secondary data. Consequently, the study found that the use of AI would significantly aid students with learning disabilities, including ADHD, autism, and dyslexia. Also, the study notes that a critical element in the design of curricula for adolescents with ADHD is the early detection of these learning disabilities in children. This is because early detection brings about early intervention and aids the effectiveness of intervention methods. This would enable the integration of diverse learning styles, provide timely interventions, and empower students with ADHD to achieve their full potential. Consequently, it is paramount for educators to equip themselves with the requisite skills and technical know-how needed for hands-on teaching in the digital age. As such, the study recommends the need for prioritization of policies for AI integration in schools by the Nigerian government. This should be done with international partners, AI experts, and private enterprises.

**Keywords:** Attention Deficit/Hyperactivity Disorder (ADHD), Artificial Intelligence, Inclusive Education, Adaptive Curriculum Strategies, Learning Disability

### Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) has been identified as the most common childhood neurodevelopmental disorder and is estimated to have a prevalence of 7.2% in patients under 18 years (Ayano et al., 2023). Usually diagnosed in children 2-17, symptoms may continue to adulthood where intervention methods prove inadequate or ineffective (Danielson et al., 2018). ADHD symptoms are characterized by the child's inability to focus, an inability to process information normally, and most importantly, an inability to engage with traditional curriculum methods (American Psychological Association, 2013). Treatment of ADHD in the past had included the use of pharmaceuticals that were aimed at decreasing hyperactivity. This method proved ineffective for long-term results (Ayano et al., 2023). In recent years, behavioral interventions have proved to be a more promising approach by targeting the control of impulsivity and self-regulation. Educational curriculums formulated with these behavioral changes in mind have proven effective in improving engagement in students with ADHD (Salari et al., 2023).

In Nigeria, where resources provided by the government for education are inadequate, recourses targeted at children and adolescents with learning disabilities are minimal at best (Brydges & Mkwandawire, 2020). These inadequate resources include a lack of skilled educators to facilitate

diagnosis or intervention strategies, a lack of learning tools and aids, corrupt industry governance, and ineffective intervention methods (Hui et al., 2018). While government-sponsored infrastructure for learning disabilities is inadequate, privately owned ones are too expensive for middle-class Nigerian families to afford. However, technological advancements have introduced alternatives to traditional education methods into conventional learning. The accessibility of new electronic tools targeted at learning disabilities holds the potential for addressing the educational needs of adolescents with Attention Deficit Hyperactivity Disorder (ADHD).

The introduction of AI (Artificial Intelligence) learning has reinvented global education systems and is changing how practitioners develop teaching strategies for students in formative schools. It has led to more adaptive and person-centered learning environments, especially for students with physical and learning disabilities (Barua et al., 2022). These innovations include personalized learning and adaptive content, speech recognition and Natural Language Processing (NLP), intelligent tutoring systems and virtual assistants, assistive technology for visual and auditory processing, Social and Emotional Learning (SEL) Support, and data-driven insights for educators and caregivers (Kabudi et al., 2021). These tools can be further directed towards effective curriculum building for students diagnosed with ADHD in Nigeria. Through AI, a more customized, responsive approach can be developed to better support these students.

In as much as many scholars of education have investigated learning disabilities in Nigeria, there is not much literature addressing the administration of disability curriculum, especially in students with ADHD. This research paper aims to investigate how AI can be used to formulate educational curricula for adolescents with ADHD in Nigeria amidst social, economic, and administrative challenges. This is a five-sectioned paper consisting of an introduction, a review of existing literature, methodology, and results of a qualitative analysis, discussion, conclusions, and recommendations.

The world is experiencing rapid and dramatic changes as a result of technological advancements and innovation (Onyema, 2020). In the last ten years, one of these advancements involved the evolution of AI from an aspect of computing science into a part of daily life. A rise in global literacy has also ensured its adoption and influence in all industries of which education is no exception (Barua et al., 2022, Kabudi et al., 2021, Onyema, 2020). This has given rise to scholarly investigations into leveraging AI as a tool for improving the efficiency, extensiveness, and transparency of education.

## **AI in Education**

Since the creation of the first electronic digital computers in the 1940s, the potential for the use of technology in education has been harnessed with different degrees of success and challenges (Barua et al., 2022). AI in education has been used to enhance administrative and operational efficiency, learning analytics and data evaluation, curriculum building and implementation, student support and mentorship, language and communication learning, learning accessibility, guidance and counseling, and most importantly, personalized and adaptive learning (Onyema, 2020). Many works of literature point out the provision of personalized learning that fits a student's characteristics, mental capacity, learning status, and environmental and social preferences as one of the most important contributions of AI in education (Bhutoria, 2022, Pataranutaporn et al., 2021). Another contribution is to enhance the learning process once these peculiarities are identified (Holmes & Tuomi, 2022). This aspect of AI use in education necessitates and critically involves the use of new-age instructors and educators as less-experienced ones will face the challenges of developing impromptu responses to learning process emergencies. According to Pataranutaporn et al., (2021) improving education processes through AI involves the evolution of academic professionals and policymakers into technology-savvy

individuals and teams that work together to harness the opportunities and mitigate the resulting challenges of the global AI explosion. Nguyen et al. (2023) assert this notion in addition to identifying that the lack of this embrace can be attributed to the reluctance to accept AI systems and the transparency that they ensure. AI systems have proved to enhance not only student evaluation systems but have also increased the monitoring of teaching processes and methods, the educator's evaluation techniques offer possibilities for educator performance evaluation.

### **The Use of AI in Nigerian Primary and Secondary Schools**

The adoption of AI in Nigerian primary and secondary schools is key to the transformation needed for inclusivity and adaptability, however, due to socio-economic, cultural, political, infrastructural, and policy limitations, the achievement of AI integration is slow, and far from seamless (Martens et al. 2020). According to Abdulmajeed (2020), the use of AI technology in Nigerian schools is hindered due to poor policy, limited access, inadequate funding, and resistance to change. This view is also expressed by Brydges & Mkandawire (2020) who summarises these challenges as stemming from the inability of the Nigerian government to implement its policies that promote digital literacy by consistently underfunding information technology initiatives. It is also important to note that these challenges are not unique to Nigeria as most African developing countries face similar technological inadequacies (Hui et al., 2018).

### **Curriculum Building for Students with Learning Disabilities**

Lack of inclusion in education leads to a higher rate of school dropouts in any country. Even in a developing country like the United States, over 18% of children with learning disabilities drop out of school (Habdank-Kolaczowski et al. 2023). Building a curriculum to include students with learning disabilities requires creating an inclusive, flexible, and supportive educational plan tailored to meet diverse learning needs (Cibrian, 2022). Consideration must be given to various elements like the ability to identify individual learning needs, setting clear, achievable learning goals, developing an Individualized Education Program (IEP), using differentiated instruction Techniques, incorporating assistive technology, using multi-sensory teaching approaches, creating channels of feedback and positive reinforcement, encouraging parental and family involvement so that intervention is on two fronts and most importantly, creating flexibility for the regular evaluation and adjustment the curriculum (Osuji-Alatilehin, 2016).

### **ADHD and Educational Challenges**

ADHD affects adolescents in all parts of the world. Common symptoms include impulsivity, hyperactivity, and the inability to stay attentive. Each child may manifest these symptoms with different degrees of severity (American Psychological Association, 2013). These peculiarities make the standard models of learning typically used in classrooms insufficient to teach these students. Scholars have found that ADHD children respond better to an instructional approach that prioritizes interaction, engagement, and self-pacing (Ayano, 2020). These attributes are usually the characteristics of modern AI tools.

Experts in inclusive education have proffered that adaptive AI models can help tackle ADHD symptoms in adolescent challenges by offering options tailored to a student's specific needs (Chattopadhyay, 2024). The tools may fall under one or more of these categories: responsive digital tutors, AI-driven educational games, time management and activity tracking applications, progress-tracking and assessment applications, AI-powered mind-mapping, and organizational tools, adaptive

learning textbooks with AI features, classroom management, and behavior tracking applications, AI-driven text-to-speech and transcription applications (Barua, 2020).

However, due to limited research on the application of these tools in Nigeria where the technology infrastructure is inadequate, addressing the needs of children with learning disabilities especially ADHD remains a challenge.

### **Statement of the Problem**

Developing countries like the United States of America have extended and broadened studies aimed at ADHD diagnosis, management, and inclusive education curricula building. Advancements have been made in MRI (Magnetic Resonance Imaging) technology for early detection. The same observations have not noted in Nigeria. Despite the growing interest of many scholars of education in learning disabilities in Nigeria, there is not much research done to address the administration of disability curriculum, especially in students with ADHD.

Government funds provided for education are never sufficient and much less can be said for that set aside for children with disabilities. In each of the 36 states and the Federal Capital Territory (Abuja), there are about four to five special or inclusive schools (Brydges & Mkandawire, 2020). With a combined enrollment capacity of about a thousand students, these schools are insufficiently equipped to address the needs of about ten million children with disability in Nigeria. This number accounts for about 15% of the estimated child population (Brydges & Mkandawire, 2020). Efforts to create inclusive education have been hit with many challenges. These challenges include insufficient human, financial, and infrastructural resources, illiteracy, lack of exposure of care providers, corruption and lack of transparency, and misappropriation of funds (Hui et al., 2018). While some major states have policy frameworks supporting inclusive education, their implementation remains limited. Families with better means opt for private education providers which are significantly much more difficult for middle to low-income families and rural communities to afford.

However, in today's world, characterized by rapid technological advancements, there are emerging alternatives to traditional education formats that promote, simplify, and subsidize education that targets children with learning disabilities (Barua, 2020). The accessibility of new electronic tools targeted at learning disabilities holds the potential for addressing the educational needs of adolescents with Attention Deficit Hyperactivity Disorder (ADHD) and efforts should be directed towards leveraging them for inclusive curriculum building.

### **Research Aim**

#### **The research aims to:**

1. Ascertain through extensive secondary research, how advancements in AI technology can be leveraged to the creation of curricula that address the learning challenges faced by adolescents with ADHD in Nigerian schools.
2. Identify AI tools and intervention approaches better fitted for this demographic  
Proffer approaches for creating frameworks for inclusive curriculum design.

### **Research Questions**

This research answered the following research questions

1. How can AI technology promote personalized learning for adolescents with ADHD in Nigerian schools?

2. What AI-powered tools can be adopted into school curricula for better engagement and comprehension among adolescents with ADHD?
3. What are the challenges of adopting AI technology for inclusive education in Nigerian schools?

### Methodology

This study will employ qualitative and quantitative secondary data collection techniques to examine AI’s impact on ADHD-friendly curriculum development. The research questions require nuanced insight into the experiences of students with ADHD and the reflections of the educators and professionals who adopt AI in curriculum formation thus a textual evaluation is used in this research. It adopts an interpretivist strategy in its analysis but also uses numeric data where necessary. It also has a problem-solving element as it seeks to create a framework for real-life practices. Secondary data was assembled from reliable scholarly journals, peer-reviewed articles, education reports, and publications. The selection of data was assessed by their relevance, time of publication, dependability, and academic rigor. Data analysis for this research was done using thematic qualitative analysis. It was analyzed using descriptive approaches to analyze both the textual and statistical values to summarize student engagement and academic outcomes of curriculum inclusion. Qualitative data was coded thematically to identify recurring patterns in stakeholder perspectives on AI-driven adaptive learning for ADHD students. The thematic procedure used was data familiarisation, generation of code, search for themes, review of themes, the definition of themes, and report production.

### Results of Data Analysis

The investigations of this work led to the unearthing of the following themed findings:

#### AI in Early ADHD Detection

In developed countries like the United States, children are diagnosed with learning disabilities as young as 1 year old. The most prevalent being, ADHD, dyslexia, and dysgraphia (Habdank-Kolaczowski et al. 2023). The country prioritizes early detection as it is believed that early detection leads to early intervention and the effectiveness of intervention methods (Loh et al. 2022). In ADHD detection, clinical advancements and innovations have been made in the use of AI to diagnose ADHD in adolescents. This innovation employs the analysis of specialized brain MRI scans to identify differences in nine brain matter tracts in people with ADHD (RSNA, 2023). Before this discovery, the diagnosis of the condition was difficult due to the intricacies of the condition and the inadequacies of the available diagnostic tools. For developing countries, however, AI-driven tools like diagnostic apps, ready-made questionnaires, and observatory technology are easier to access and utilize.

#### AI tool with Potential for Inclusive Curriculum Building

Through the exploration of a vast number of AI-driven apps, many were found to have the potential to aid educators create inclusive curricula for ADHD adolescents. These apps include but are not limited to the following:

**Table 1: Artificial Intelligence (AI) Tools & Integration**

| S/N | AI TOOL    | TYPE                               | TARGET  |
|-----|------------|------------------------------------|---|
| 1   | Cognii     | AI tutor for personalized learning | designed to reduce the feeling of being overwhelmed |
| 2   | Focus@Will | AI-based productivity and focus    | designed to improve                                 |

|    |                         |  |  |
|----|-------------------------|--|--|
|    |                         | app  | focus and concentration                              |
| 3  | Khan Academy            | Online learning platform with adaptive content | Promotes self-pacing and provides immediate feedback |
| 4  | Brainly                 | Homework help platform                         | Fosters engagement and confidence                    |
| 5  | Quizlet                 | Study tool                                     | Helps with information retention                     |
| 6  | MindNode                | organizational tool                            | Tackles organization and planning challenges         |
| 7  | Otter.ai                | transcription and note-taking app              | Helps with note-taking                               |
| 8  | SmartBook (McGraw-Hill) | Adaptive learning textbook                     | Target engagement and concentration                  |
| 9  | ClassDojo               | Classroom management and behavior tracking app | Primarily for educators to track progress            |
| 10 | Kurzweil 3000           | text-to-speech and literacy support tool       | Helps with comprehension and note-taking             |

### AI Integration Advocacy

It is undeniable that there is a strong case for using AI to support students with learning disabilities, including ADHD, autism, and dyslexia however in Nigeria resources are limited. Despite advocacy from educators, non-governmental organizations, and other stakeholders for inclusive learning policies, Nigeria still faces challenges that include poor infrastructure and internet access, high costs of funding AI tools, lack of skilled educators, urban-rural disparities, and other economic barriers. Most scholars identified the main hindrance as a lack of government policies to meet this need. In the area of cost, Adaptive learning platforms such as Cognii, Khan Academy, Smart Sparrow, and DreamBox, which adjust in real-time to learner responses are relatively cheap to maintain for use in schools if there are suitable government policies in place.

### Discussion

The findings highlight the importance of the introduction of AI into education curriculum-building processes to support the management of ADHD in adolescents when it comes to learning and personal development. The importance of AI in disability education has exhibited the potential to transform the industry in many areas. These areas include administrative work, treatment, diagnostics, rehabilitative and predictive practices, decision-making, and personalized learning. These impacts as recounted by Secinaro et al (2021) include better management of vast amounts of student data, identification of new learning methods, and reduction in learning costs for those with disability.

To address the first research question, findings identified diagnosis, adaptive learning, and feedback as ways in which AI has been used to promote personalized learning for adolescents with ADHD. For effective personalized learning implementation, AI helps in the identification and diagnosis of ADHD. The findings reported that innovation has been made in the use of AI to diagnose ADHD in adolescents. The innovation includes MRI scans, diagnostic apps, ready-made questionnaires, and observatory technology (Loh et al., 2022). The innovation of using AI to diagnose ADHD would engineer a much-needed impact in the future of psychological studies in several ways. Early detection leads to early intervention.

After detection, AI-powered learning platforms can tailor their content to each student depending on their degree of disability, current performance, learning difficulty, or learning style. It also creates an adaptive assessment and feedback to both students, teachers, and other stakeholders.

For the second research question, curriculum building for ADHD students in Nigeria can be facilitated by employing or mimicking aspects of the personalized learning approach existing in AI-driven education apps. Since AI can analyze each student's strengths and weaknesses, interests and reading habits, progress or lack thereof, educators can use this information to adjust or tailor their teaching methods to target aspects of learning where the students need more support. With constant adjustments a much more defined learning system can emerge for the intended demographic. This brings about an inclusive education system. A school of thought has argued that personalized learning will challenge the validity of traditional group learning however, while traditional group learning was based on similar goals and resources, personalized learning focuses on individual ability even when given the same goals and resources.

To answer the third question, the research findings indicate that despite the education sector in Nigeria professing the willingness to cater to students with learning disability, the Nigerian education infrastructure poses a challenge to educators. The challenges include poor infrastructure and internet access, high costs of funding AI tools, lack of skilled educators, urban-rural disparities, and other economic barriers (Osuji-Alatilehin, 2016). These challenges, when studied in detail stem from government policies that are inadequate or lack clear definitions. Most Western countries have developed frameworks for AI integration schools and other learning institutions. Nigeria on the other hand lacks policies that support such integrations. Despite all these, there is still active advocacy for AI integration in schools. With a clear framework AI integration in schools would easily bring about equity in learning.

## **Conclusion**

In conclusion, AI integration into the Nigerian education climate to include students with ADHD and other learning disabilities offers the potential for transformation in Nigeria. AI's potential as a tool for inclusive curriculum creation for adolescents with ADHD includes personalized learning tools, channels for real-time feedback and encouragement, reporting and transparency of student progress, bridging gaps in educational support, concentration-enhancing tools, and frameworks for curriculum customization. AI can address ADHD challenges and enable students to reach their full potential.

Despite these potentials, Nigerian schools need infrastructural boosting, teacher training, and a clear map of government policies for successful AI integration. Investment from government bodies, private entities, and international organizations is essential for AI solutions to exclusive education to be sustainable. By leveraging advancements in AI, Nigerian educators can create curricula that are more inclusive for adolescents with ADHD.

## **Recommendations**

This research offers two recommendations derived from the results of this research:

**Stakeholders' Investment in Digital Infrastructure:** The Nigerian government should prioritize policies for AI integration in schools. This can be done in collaboration with international partners, AI experts, and private enterprises, to provide better digital facilities for learning and bridging education accessibility gaps.

**Personal Development of Educators in AI-driven Learning Tools:** Educators should prioritize

equipping themselves with the technical know-how required for hands-on teaching in the digital age. These comprehensive teacher training programs are not limited to learning AI essentials but also promote adaptability for impromptu responses to addressing learning disability needs in adolescents with ADHD.

## References

- Abdulmajeed, K., Joyner, D. A., & McManus, C. (2020). Challenges of online learning in Nigeria. In Proceedings of the Seventh ACM Conference on Learning@ Scale. pp. 417-420).
- American Psychological Association. (2013). Psychological Disorders: Unit Lesson Plan for High School Psychology Teachers. <https://www.apa.org/ed/precollege/topss/lessons/psychological-disorders.pdf>
- Ayano, G., Demelash, S., Gizachew, Y., Tsegay, L., & Alati, R. (2023). The global prevalence of attention deficit hyperactivity disorder in children and adolescents: An umbrella review of meta-analyses. *Journal of Affective Disorders*, 339, 860-866.
- Ayano, G., K. Yohannes, & Abraha, M. (2020). Epidemiology of attention-deficit/hyperactivity disorder (ADHD) in children and adolescents in Africa: A systematic review and meta-analysis. *Ann Gen Psychiatry*.
- Barua, P. D., Vicnesh, J., Gururajan, R., Oh, S. L., Palmer, E., Azizan, M. M., & Acharya, U. R. (2022). Artificial intelligence-enabled personalized assistive tools to enhance education of children with neurodevelopmental disorders—a review. *International Journal of Environmental Research and Public Health*, 19(3), 1192.
- Bhutoria, A. (2022). Personalized education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. *Computers and Education: Artificial Intelligence*, 3, 100068.
- Brydges, C., & Mkandawire, P. (2020). Perceptions and experiences of inclusive education among parents of children with disabilities in Lagos, Nigeria. *International Journal of Inclusive Education*, 24(6), 645-659.
- Chattopadhyay, M. (2024). Advancements in artificial intelligence for special educational needs: Diagnostic and intervention. In *Artificial Intelligence Education* (p. 206).
- Cibrian, F. L., Lakes, K. D., Schuck, S. E., & Hayes, G. R. (2022). The potential for emerging technologies to support self-regulation in children with ADHD: A literature review. *International Journal of Child-Computer Interaction*, 31, 100421.
- Danielson, M. L., Bitsko, R. H., Ghandour, R. M., Holbrook, J. R., Kogan, M. D., & Blumberg, S. J. (2018). Prevalence of parent-reported ADHD diagnosis and associated treatment among US children and adolescents, 2016. *Journal of Clinical Child & Adolescent Psychology*, 47(2), 199-212.
- Habdank-Kolaczowski, J. S., Akahara, P. C., Ishola, F., Salawu, M. A., Augustine, S. W., Ezeamii, V. C. & Okobi, O. E. (2023). Attention-Deficit Hyperactivity Disorder Among American Youth: A Comprehensive 20-Year Analysis of National Center for Health Statistics (NCHS) Data. *Cureus*, 15(11).
- Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education*, 57(4), 542-570.
- Hui, N., Vickery, E., Njelesani, J., & Cameron, D. (2018). Gendered experiences of inclusive education for children with disabilities in West and East Africa. *International Journal of Inclusive Education*, 22(5), 457-474.
- Kabudi, T., Pappas, I., & Olsen, D. H. (2021). AI-enabled adaptive learning systems: A systematic mapping of the literature. *Computers and Education: Artificial Intelligence*, 2, 100017.
- Loh, H. W., Ooi, C. P., Barua, P. D., Palmer, E. E., Molinari, F., & Acharya, U. R. (2022). Automated detection of ADHD: Current trends and future perspective. *Computers in Biology and*



- Medicine, 146, 105525.
- Martens, M., Hajibayova, L., Campana, K., Rinnert, G. C., Caniglia, J., Bakori, I. G. & Oh, O. J. (2020). Being on the wrong side of the digital divide: Seeking technological interventions for education in Northeast Nigeria. *Aslib Journal of Information Management*, 72(6), pp. 963-978.
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B. & Nguyen, B. P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221-4241.
- Onyema, E. M. (2020). Integration of emerging technologies in teaching and learning process in Nigeria: the challenges. *Central Asian Journal of Mathematical Theory and Computer Sciences*, 1(11), 35-39.
- Osuji-Alatilehin, S. (2016). *Towards Inclusive Education in Nigeria: Appreciative Voices of Parents and Educators of Primary School Children With(out) Disabilities* (Doctoral dissertation, Flinders University, School of Education.).
- Pataranutaporn, P., Danry, V., Leong, J., Punpongsanon, P., Novy, D., Maes, P., & Sra, M. (2021). AI-generated characters for supporting personalized learning and well-being. *Nature Machine Intelligence*, 3(12), 1013-1022.
- Radiological Society of North America. (2023). AI may aid in diagnosing adolescents with ADHD. *ScienceDaily*. [www.sciencedaily.com/releases/2023/11/231129150117.htm](http://www.sciencedaily.com/releases/2023/11/231129150117.htm)
- Salari, N., Ghasemi, H., Abdoli, N., Rahmani, A., Shiri, M. H., Hashemian, A. H. & Mohammadi, M. (2023). The global prevalence of ADHD in children and adolescents: a systematic review and meta-analysis. *Italian journal of pediatrics*, 49(1), 48.
- Secinaro, S., Calandra, D., Secinaro, A., Muthurangu, V. & Biancone, P. (2021). The role of artificial intelligence in healthcare: a structured literature review. *BMC medical informatics and decision making*, 21, 1-23.