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# GENDER INCLUSION THROUGH AI-DRIVEN TECHNOLOGY: BREAKING BARRIERS AND BRIDGING GAPS

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ABSTRACT

*Artificial Intelligence (AI) is rapidly transforming educational systems worldwide. Accordingly, this paper explores how AI-driven technology education can promote gender inclusion by breaking down historical barriers and creating equitable access to learning opportunities. Specifically, it reviewed the effects of AI on women's empowerment in the in the society today with a bias for core Northern states in Nigeria. It critically examines the challenges women face in technology education and STEM as well as evaluates how AI can serve as a tool to bridge the digital and gender divide. It probes into AI's capacity to close gender gaps, enhance technical education and to promote gender parity by recommending ways to achieve gender inclusion in line with global best practices that support inclusive AI-enhanced education. The paper took the part of examining few case studies and initiatives which underscore the potential benefits and hurdles associated with AI in propelling gender inclusion and women empowerment. The results indicate that while AI holds promise for advancing women's empowerment, it necessitates diligent efforts to mitigate biases and uphold inclusivity.*

## INTRODUCTION

Generally, technology education has long been associated with gender disparity, particularly with the underrepresentation of women in STEM fields Noteworthy is that this scenario is made possible by societal expectations and believe that one gender has more physical strength and acumen for technological task than the other. However, the advent of artificial intelligence (AI) brings with it new opportunities to address these disparities through personalized, accessible, and inclusive learning tools capable of reshaping how knowledge is delivered, how learners engage with content, and how educators monitor and support

academic progress (Luckin et al., 2016). In recent years, Artificial Intelligence (AI) has emerged as a potent force capable of reshaping numerous facets of society. Within Nigeria, a nation grappling with entrenched gender disparities and social hurdles, AI stands poised to wield substantial influence in advancing women's empowerment. Gender inclusion in Technical and Vocational Education and Training in North West Nigeria experiences constraints, primarily orchestrated by deep-seated socio-cultural and religious norms, early marriage, and patriarchal views that marginalize women in technical fields. Despite strides made towards women's empowerment in this diverse and culturally vibrant country like Nigeria, persistent gender inequities endure across key domains such as education and technology. Deep-rooted societal biases, unequal access to resources, and limited opportunities continue to impede the advancement of women throughout the nation.

AI applications such as intelligent tutoring systems, automated assessments, and personalized learning environments are increasingly being deployed in educational settings across the world. While these developments bring numerous benefits, they also raise critical questions about equity, particularly in relation to gender and inclusion in technology education.

Gender disparities in education, especially within science, technology, engineering, and mathematics (STEM), have been a longstanding global concern. According to UNESCO (2017), women represent less than 30% of the STEM workforce worldwide, a figure that reflects systemic exclusion rather than a lack of ability or interest. This underrepresentation is rooted in multiple factors, including cultural and social norms, lack of female role models, gender-biased curricula, limited access to digital tools, and institutionalized discrimination. These barriers are particularly pronounced in low-income and developing countries, where educational inequality is exacerbated by poverty, infrastructural deficits, and restrictive gender roles (UNESCO, 2021).

## 2.0 Conceptual Clarification

### 2.1 Gender Inclusion

Gender equality is a state in which people have access to rights or opportunities regardless of gender. Gender-inclusive language is speaking and writing in a way that does not discriminate against a particular sex, social gender or gender identity, and does not perpetuate gender stereotypes Gender inclusion can also be referred to efforts and practices that ensure equal participation, access, and outcomes for individuals of all gender identities in educational, economic, and social contexts (UNESCO, 2020). Therefore, Inclusion generally strives to make all people feel valued and respected. With respect to the title of this paper, Gender inclusion in Technical and Vocational Education means ensuring everyone, regardless of gender, has equal opportunities to acquire skills and pursue careers in tech and vocational fields. It's about breaking down barriers and stereotypes that might limit someone's potential based on their gender. In practice, this means creating learning environments where women and men, boys and girls feel welcome and supported to explore fields like engineering, IT, construction, or any technologically based profession. It involves providing targeted support like scholarships, mentorship, and addressing biases to ensure underrepresented groups flourish. Therefore, the goal is simple: equip people with skills for success in technical and vocational careers, free from gender constraints.

**2.2 Artificial Intelligence in Education (AIED):** Artificial Intelligence, AI for short, is a technology that enables machines, specifically computer programs, to learn, think, and act for themselves. This means that AI has the ability to take in large amounts of data, process it, and make decisions very much like a human could, but much, much faster. AI is a broad and deep field of study. The term "AI" is not reserved for the kind of learning that goes on in a

computer when a program is being written or perfected. That's better known as "machine learning". Instead, it refers to technology where there is some element of decision making, for example using complex math and logic, by neural networks or by a human method such as inductive logic. Hence, the AIED involves the use of machine learning, data analytics, natural language processing, and intelligent tutoring systems to enhance the teaching and learning experience (Luckin et al., 2016).

Artificial Intelligence (AI) in Technical Education refers to the use of intelligent systems and algorithms to enhance learning, teaching, and training in technical fields like engineering, IT, and applied sciences. AI can personalize learning paths, automate assessments, and provide predictive analytics to improve student outcomes. In technical education, AI-powered tools can simulate real-world scenarios for practice, offer real-time feedback on projects, and help bridge skill gaps by suggesting targeted resources. For instance, AI-driven platforms can help students learn programming by providing instant code reviews or suggesting improvements, according to the UNESCO report "AI in Higher Education" (2021), AI can make technical education more accessible and effective by adapting to individual learning styles

### 2.3 Technology Education

Technology education is the study of technology, in which students "learn about the processes and knowledge related to technology". As a field of study, it covers the human's ability to shape and change the physical world to meet needs, by manipulating materials and tools with techniques. It also refers to the study and application of technological systems, tools, and processes, preparing individuals for careers in technical and vocational sectors (International Technology and Engineering Educators Association, 2020).

## 3.0 Historical Context of Gender Inequality in Technology Education

Historically, technical fields (STEM) have been male-dominated, with gendered stereotypes discouraging girls and women from pursuing careers in science and technology. These patterns persist in part due to societal expectations, lack of female mentors, and biased teaching practices (UNESCO, 2017). In some part of Africa for instance, only 30% of students enrolled in STEM-related courses in tertiary institutions are female (UNESCO, 2021). Factors contributing to this include early marriage, domestic responsibilities, and gender-based violence, all of which limit girls' ability to pursue long-term education.

### 3.1 The State of Gender and Inclusion in Technology Education

The state of gender inclusion in technology education has been a pressing concern in recent times. Despite progress, women continue to face challenges in accessing technology education. Globally, women make up only 26-28% of tech roles, with even lower representation in technical positions like software engineering (15-20%) and leadership roles (10-12%). Gender equality in technology remains limited, with women holding only about 27-30% of technical or technological roles globally and occupying only 6% of top CEO positions. Despite slow progress, women remain underrepresented in technical. For instance, women hold roughly 27.6% of jobs in the tech industry as of 2022, a figure that has seen minimal growth despite awareness. While only 6% are at the top of 100 global technology. Furthermore, for every 100 men promoted to manager in tech, only 52 women. In same vein about 44% of analysed Artificial negligence systems demonstrate gender bias further poised to amplify existing stereotypes and inequality.

In Nigeria, there exist wide variations in general education across the States and zones with the North east and North west presenting the worst scenarios in Nigeria Abdullahi Magaji

et'al (2019). Recent evidence indicates that gender disparities in education and early marriage remain pronounced in Nigeria, particularly in the northern regions. Nationally, more than 18.5 million children are out of school, with girls constituting the majority (about 10 million), and in some northern areas fewer than one-fifth of girls attend secondary school (MarieClaire Nigeria, 2024). Complementary estimates suggest that about 7.6 million girls are currently out of school, with average lower-secondary attendance for girls around 48.8%, but falling sharply in states such as Sokoto (15.8%) and Katsina (27.6%) (UNICEF, 2025). Early marriage remains a major structural barrier to girls' education and empowerment: over 3.7 million Nigerian women aged 20–24 were married before age 18, and approximately one-third of young women nationally (33.4%) marry before 18, with prevalence approaching 50% in the North-East and North-West regions (UNICEF, 2025). State-level analyses further reveal the depth of the challenge, showing that among women aged 20–24, child marriage rates reach as high as 82.1% in Katsina and 76.9% in Jigawa, underscoring persistent socio-cultural constraints that limit girls' educational participation and access to opportunities in fields such as technology and innovation (Save the Children Nigeria, 2025). Together, these statistics demonstrate that despite gradual progress, northern Nigeria continues to experience severe and systemic gender gaps in education and life opportunities for girls.

In Nigeria, efforts are being made to promote gender inclusion in tech education. The MTN Foundation and Women innovate have joined forces to bridge the gender gap in science and technology. The 4th Women in Tech and Engineering Summit in Abuja emphasized the importance of mentorship, skills development, and targeted investments in STEM fields.

Overall, while progress has been made, there is still a need for sustained efforts to achieve gender parity in tech education. Encouraging girls and young women to pursue STEM careers can drive innovation and economic growth.

## 4.0 Challenges and Considerations in AI-driven Gender Inclusion in Technology education

While AI-driven technology education has the potential to promote gender and inclusion, there are challenges with gender inclusion in Technical and Vocational Education and Training (TVET) in North West Nigeria. These challenges connote faces severe constraints, primarily driven by deep-seated socio-cultural and religious norms, early marriage, and patriarchal views that marginalise women in technical fields. Key barriers include Bias in AI, limited access to education, inadequate infrastructure, insecurity, and low female enrollment in STEM and technical trades like engineering. and considerations to be addressed:

### 4.1 Bias in AI

The use of AI in education is not without risks. AI algorithms can perpetuate biases if not designed with inclusivity in mind. AI systems are only as unbiased as the data they are trained on, and many AI models reflect the societal inequalities embedded in historical datasets (Crawford, 2021). If not carefully designed and monitored, AI technologies may unintentionally reinforce gender stereotypes (Binns, 2018). For example, an AI system that prioritizes performance metrics without considering socio-cultural contexts may mislabel female learners as underperforming, further entrenching negative biases.

### 4.2 Barriers to Gender Inclusion in Technology Education

Socio-Cultural Standards in many cultures, societal expectations place women in traditional, non-technical roles. Societal standards and biases like believe that women are only good in domestic roles and that the need physical strength to excel in technical tasks discourage

women from entering tech fields. These norms discourage female students from exploring technology-related fields (UN Women, 2019).

Digital Divide Women and girls in developing countries are significantly less likely to have access to digital devices and the internet. GSMA (2020) reports that women in low-income nations are 20% less likely to own smartphones.

Gender-Biased Curricula and Teaching Methods Educational content often includes gender stereotypes, for example teachers might encourage boys more in subjects like math and science, while offering more praise to girls for behavior and neatness rather than intellectual contributions. This and other classroom dynamics may discourage female participation. AI systems that rely on biased data may further intensify these issues (Binns, 2018).

Limited Role Models and the lack of visible female leaders in tech discourages girls from envisioning themselves in similar roles. Mentorship and exposure to successful women in STEM are critical.

## 5.0 Breaking Barriers with AI-Driven Technology Education

First, it's important not just to see women and girls as users of technology rather as creator of technology, promoters, and decision-makers in that field. One assumption is that the use of digital tools will increase for everyone with universal internet access. But what we see is that 76% of the population living in least developed countries are covered by mobile broadband signal, but only 25% are online. And out of those 25%, men are 52% more likely to be online than women. So, infrastructure alone is not sufficient to reach meaningful access for women. Other critical factors are affordability, digital literacy, privacy, safety, content, relevance, ownership, awareness about tools, agency, or even access to electricity.

AI-driven technology education can help break barriers in several ways among which include the undermentioned:

Personalized Learning: AI can tailor learning experiences to individual needs, talent and styles.

Accessible Learning: AI can make technology education more accessible to underrepresented groups. Connecting the many million women that still lack access to mobile networks AI tools is of paramount importance to foster a more inclusive technological education.

Inclusive Curriculum Design: AI can help design curricula that address the needs and interests of diverse learners.

Initiatives to Promote Gender Inclusion: Girls and Women with talent in Technology education can be empowered through training and advocacy.

Bridging Gaps with AI-Driven Technology Education

AI-driven technology education can help bridge gaps in several ways as recommended below:

### Mentorship Programs

AI can facilitate mentorship programs for underrepresented groups. Mentorship programs leveraging AI have the potential to revolutionize how underrepresented groups access guidance and support in tech and beyond. By harnessing AI-driven matching algorithms, these programs can connect individuals with mentors who share similar interests, goals, or

backgrounds - fostering more meaningful relationships. AI breaks down geographical barriers, opening doors to a global pool of experts who might otherwise be out of reach. This is particularly empowering for those in remote or underserved areas where local mentorship opportunities are scarce. Personalized learning paths, suggested by AI, help mentees focus on skills that matter most to their growth. Whether it's coding, leadership, or navigating industry challenges, AI tailors' resources to individual needs. Scaling support is another AI advantage. With the ability to manage large numbers efficiently, more people can access mentorship without overwhelming human coordinators. For underrepresented groups, AI-driven mentorship programs offer targeted support. They can address specific challenges women, minorities, or other groups face in tech, providing a safe space to share experiences and gain advice. The key is ensuring AI systems are designed to be fair and inclusive. If done right, these programs can build bridges to opportunities, helping create a more diverse and equitable tech landscape

Networking Opportunities: AI can provide networking opportunities for underrepresented groups.

**Role Models and Representation**

AI can promote role models and representation in technology education. Mentorship and community feature foster connections, allowing for shared experiences and collaboration in the form of Scholarships and financial aid, paired with AI-driven education, can remove cost barriers, thereby encouraging more gender inclusivity.

**Infrastructure and Resources**

AI-driven technology education requires infrastructure and resources to be effective as well as to ensure gap are bridged. Investing in infrastructure and resources is crucial to making AI-driven tech education accessible to women. Robust digital platforms, high-speed internet, and AI-powered learning tools can bridge geographical gaps, allowing women from underserved areas to tap into quality education. Cloud-based labs and virtual environments enable hands-on practice without expensive hardware, leveling the playing field. Partnerships with telecoms and tech companies can provide affordable devices and data plans, tackling connectivity hurdles. Curated content, including video tutorials and interactive modules, caters to diverse learning styles. AI-driven platforms offer personalized feedback and support, helping women progress at their own pace. To succeed, initiatives must prioritize inclusivity, ensuring AI tools are accessible and content is culturally relevant. With the right infrastructure, AI-driven education can empower women, equipping them with skills to thrive in vocational technology.

## 6.0 Conclusion

Artificial Intelligence (AI) holds significant promise in addressing and mitigating various challenges faced by women, including gender bias and discrimination. By leveraging AI algorithms, biases in recruitment processes, performance evaluations, and decision-making systems can be reduced, leading to fairer outcomes and increased opportunities for women in education, employment, and leadership roles. Furthermore, AI applications can improve women's access to quality healthcare and address gender-specific health issues. However, it is crucial to recognize and address potential challenges and risks associated with AI. Gender bias in training data and algorithmic decision-making can perpetuate existing inequalities and further marginalize women. To fully realize the potential of AI in promoting women's

empowerment, it is imperative to adopt inclusive and ethical practices. This includes actively engaging women in AI development and decision-making processes. By embracing inclusive and ethical AI practices, we can harness the full potential of AI as a powerful tool for achieving gender equality and creating a more inclusive and empowered society for all. AI-driven technology education has the potential to break barriers and bridge gaps in promoting gender and inclusion around the world.

## 7.0 RECOMMENDATIONS

In view of the conclusions from the study, the following are recommended with a view to bridging gender gaps in VTE programmes in the area:

1. AI algorithm should be used to design real time yet simple mobile videos of vocational and technical programmes geared towards solving problems of poverty, unemployment, and insecurity in the Northern area.

2. Special scholarship should be design in the area AI to female students into VTE education programmes.

3. AI induced research concept should be thought to women starting from the adolescence age to facilitate real time innovations which would in turn boost women contribution to technology.

4. Government AI algorithms should be leveraged and designed to facilitate recruitment processes that favors women.

5. Harmful institutional practices which are anti female should be campaigned against using AI tool designed in indigenous languages.

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