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Impact of Gender Inclusion Policies on Women's Participation in Science and Technology in Abuja, Nigeria

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Abstract: This study investigates the impact of gender inclusion policies on women's participation in science and technology in Nigeria, using Abuja as a case study. A mixed-methods design was adopted, involving 200 female STEM students across selected tertiary institutions. Socio-economic profiling revealed that 65% of participants were undergraduates, 76% were single, and 44% were aged between 23–27 years, with a mean household income of ₦118,500. Only 19% were employed full-time, and 51% lacked access to STEM mentorship. Participation levels were high at the academic entry point, with 94% currently enrolled in STEM programs, 62% having attended science-related events, and 58% having completed internships. However, deeper engagement was limited: only 19% had published academic work, and 29% had mentored others. Structural Equation Modelling identified five significant predictors of STEM interest: access to mentorship ($\beta=0.428$, $p<0.001$), level of education ($\beta = 0.342$, $p < 0.001$), household income ($\beta = 0.245$, $p < 0.001$), age group ($\beta = 0.187$, $p < 0.001$), and geographic region ($\beta = 0.156$, $p = 0.005$). Marital status and employment status were not significant. The model explained 64.7% of the variance ($R^2 = 0.647$). Perceptions of gender policies were mixed. While access to education (mean = 3.18) and policy awareness (3.04) were rated positively, institutional culture (2.49) and leadership inclusion (2.36) fell below the 2.5 acceptance threshold. Barriers ranked highest included gender stereotypes (mean rank = 6.87), lack of female mentors (6.12), and limited research access (5.93). These findings highlight persistent socio-cultural and structural challenges despite policy advances.

Keywords: Women in STEM, Gender Inclusion Policies, Structural Equation Modelling, Nigeria.

INTRODUCTION

Globally, gender disparities in science and technology remain an enduring challenge, with systemic barriers limiting women's full and equal participation in these critical sectors. Despite increasing attention to gender equity as both a moral imperative and a development necessity, women continue to be significantly underrepresented across nearly all STEM (Science, Technology, Engineering, and Mathematics) domains. According to UNESCO (2019), women represent only about 30% of researchers globally, and in many developing countries, their share is far lower. A combination of structural, cultural, institutional, and economic factors converges to inhibit women's participation, resulting in a leaky pipeline that progressively excludes them at various educational and career stages. International bodies such as the United Nations and the African Union have articulated robust commitments to reversing these trends, embedding gender equality in frameworks like the Sustainable Development Goals (SDG 5) and the Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) (UN Women, 2020; African Union, 2018).

These frameworks recognize that gender equity in science and technology is vital not just for fairness but for innovation, sustainability, and national development. Countries are encouraged to adopt inclusive education policies, establish gender-responsive institutional cultures, and implement targeted programs to support girls and women in STEM fields. However, the effectiveness of these initiatives remains uneven, particularly in sub-Saharan Africa where deep-rooted socio-cultural norms, resource constraints, and weak institutional capacity often blunt the force of formal inclusion strategies. While some nations have made notable strides, many others—including Nigeria—face persistent challenges in translating international commitments into effective domestic policy and measurable outcomes.

In Nigeria, the landscape of gender inclusion in science and technology is characterized by both policy intent and practical stagnation. Although the country has made various commitments to gender equity, evidenced by its adoption of the National Gender Policy (NGP) in 2006 and several national-level initiatives aimed at women's empowerment, the structural realities reveal significant gender imbalances in STEM participation across the education and labour sectors (Yunus *et al.,* 2025; Adeyemi *et al.*, 2025). At the foundational level, girls are less likely than boys to enroll in science subjects in secondary school, often discouraged by gender stereotypes, lack of role models, and curricular practices that implicitly reinforce masculine dominance in technical disciplines (Eze, 2019; Oladosu, Salami and Bello, 2020; Joel *et al.*, 2025). As girls transition to higher education, attrition rates increase due to factors such as early marriage, limited mentorship opportunities, sexual harassment in academia, and poor institutional support for balancing academic and family responsibilities (Akinola and Oludayo, 2021; Maisule *et al.*, 2025). Even among those who complete STEM degrees, entry into the professional science and technology workforce is fraught with barriers ranging from gendered hiring practices and unequal pay to hostile workplace environments and glass ceilings that limit advancement (Olaitan *et al.*, 2025; Olawumi *et al.*, 2025a). Government programs like the Girls in ICT Day initiative and gender-focused science competitions aim to foster early interest and participation, but their scope remains limited, and their impacts are rarely rigorously evaluated. At the institutional level, gender mainstreaming efforts and affirmative action quotas exist in policy but often lack robust mechanisms for enforcement or accountability (Agboola and Olayemi, 2021). Furthermore, budgetary constraints, bureaucratic inefficiencies, and inconsistent political will undermine the implementation of well-intentioned strategies. While some universities and research institutes have established gender offices or women's advocacy units, these efforts often operate in isolation and lack the institutional power or resources to effect substantial change. This policy-practice gap is emblematic of a broader issue in Nigeria's governance architecture, where formal policy adoption does not necessarily translate into substantive impact on the ground (Olawumi *et al.*, 2025b).

A critical examination of gender inclusion policies in Nigeria's science and technology sectors is therefore necessary to understand not only the extent of women's participation but the effectiveness of the institutional frameworks designed to support it. Several key factors contribute to the persistent marginalization of women in STEM in Nigeria. One is the lack of comprehensive data and impact assessments; most studies and reports rely on anecdotal evidence, case studies, or limited surveys, making it difficult to evaluate whether gender inclusion policies have succeeded in moving the needle. Another factor is the intersectionality of gender with other social categories such as ethnicity, geography, class, and religion, which compounds the disadvantages experienced by women, particularly those from rural or underserved communities (Oluwole, 2020). For instance, while urban centers may exhibit modest gains in women's science participation, rural areas continue to report negligible female representation in science education and professional sectors. Moreover, national policies often lack a decentralized implementation framework that takes these regional disparities into account. This has created a situation where well-meaning programs may be present on paper but are ineffective in practice due to misalignment with local needs and realities. Compounding this is the limited involvement of women in decision-making processes at the policy level, which means that gender inclusion strategies are often designed without the input of those they are intended to benefit. In the private sector, which plays a growing role in Nigeria's science and technology innovation ecosystem, gender inclusion is even less institutionalized, with few companies implementing diversity policies beyond tokenistic measures (Oyediji *et al.*, 2025). Yet the growing recognition of the importance of women's participation for national development, especially in addressing complex problems like climate change, food insecurity, and public health crises, underscores the urgency of reassessing how gender inclusion policies function. As the World Bank (2019) and others have argued, the exclusion of women from science and technology represents not only a social injustice but also a substantial loss of human capital, innovation capacity, and economic potential for the country. In this context, it becomes crucial to move beyond normative affirmations of inclusion to empirically grounded assessments that can inform a more effective and responsive gender policy landscape.

This study aims to evaluate the Impact of Gender Inclusion Policies on Women's Participation in Science and Technology in Nigeria. To accomplish this, the following objectives are put forward to:

- describe the socio-economic characteristics of women in science and technology in the study area.
- assess the extent of women's participation in science and technology fields across educational and professional levels in the study area.
- identify the socio-economic factors influencing young girls' interest in STEM careers in the study area.
- investigate the perceived impact of gender policies on women's inclusion in STEM in the study area.
- examine barriers hindering women's participation in science and technology in the study area.

LITERATURE REVIEW

Theoretical Framework

Gender Mainstreaming Theory

This study adopts Gender Mainstreaming Theory as its primary theoretical foundation for analyzing the impact of gender inclusion policies on women's participation in science and technology in Nigeria. Gender mainstreaming emerged in the mid-1990s as a central strategy within international development and governance institutions, most notably endorsed by the United Nations at the Fourth World Conference on Women in Beijing in 1995. The approach calls for the systematic integration of gender perspectives into all stages of policy development, implementation, monitoring, and evaluation, with the goal of achieving substantive equality between women and men in all spheres of life (UN Women, 2020).

At its core, Gender Mainstreaming Theory recognizes that gender inequality is not merely the result of individual biases or social norms, but is structurally embedded within institutional systems, policy frameworks, and governance mechanisms. In the context of science and technology in Nigeria, this theory provides a critical lens for examining whether national and institutional policies are designed in ways that account for gendered disparities and whether they incorporate accountability mechanisms, inclusive resource allocation, and gender-sensitive implementation practices. It also emphasizes the need to assess how gender is framed within policy discourse—whether as a matter of equity, efficiency, or empowerment—and the implications of these framings for policy outcomes. Applying Gender Mainstreaming Theory to this study enables a structured analysis of how effectively gender has been incorporated into Nigeria's science and technology policy architecture. It guides the examination of whether these policies go beyond rhetorical commitments and result in tangible changes in access, participation, and advancement for women in STEM fields. Moreover, it highlights the importance of institutional accountability, political commitment, and cultural transformation in achieving gender equity.

Conceptual Framework

The conceptual framework for this study, exploring the relationship between the independent variables and the dependent variable (women's participation in science and technology) being mediated by the intervening variables. The independent variables (gender inclusion policy dimensions) in this study are factors presumed to directly influence the likelihood of women's participation in science and technology which are policy content and design, gender-specific programs and interventions, and policy implementation mechanisms. The intervening variables are contextual factors that can mediate or moderate the relationship between independent and dependent variables. They include Institutional capacity and governance, cultural and societal norms, geographical and regional disparities, and intersections of gender with ethnicity, religion, and socio-economic class.

MATERIALS AND METHODS

Study Area

This study is situated in Abuja, the capital city of Nigeria and the administrative center of the Federal Capital Territory (FCT). Abuja is selected as the study area due to its political centrality, institutional presence, and relevance to gender and science policy development. It is home to several key national agencies such as the Federal Ministry of Science, Technology and Innovation, the Federal Ministry of Education, and the Federal Ministry of Women Affairs, all of which are instrumental in designing and implementing gender inclusion policies. Additionally, the National Centre for Women Development, located in Abuja, plays a vital role in promoting women's advancement in education, technology, and leadership.

Moreover, Abuja is ideal for this study because it offers proximity to policy implementers and beneficiaries alike. The presence of both high-level policymakers and grassroots organizations allows for a multi-level analysis of policy processes—from formulation to execution and local adaptation. In contrast to some regions where gender initiatives may be underfunded or less visible, Abuja often serves as the pilot location for national policy roll-outs and donor-supported gender equity programs in STEM. However, despite its administrative prominence, Abuja is not immune to the structural challenges affecting gender inclusion elsewhere in Nigeria. Therefore, selecting Abuja as the study area allows for a contextually rich, policy-relevant, and institutionally diverse examination of the dynamics between gender inclusion policies and women's participation in science and technology.

Population of the Study and Research Design

The population of this study consists of female students enrolled in science, technology, engineering, and mathematics (STEM) programs at tertiary institutions within Abuja, Federal Capital Territory (FCT), Nigeria.

A mixed-methods research design is employed. Quantitative data was collected through structured questionnaires to assess access, support, and barriers experienced by female students. Qualitative data was gathered via semi-structured interviews and focus group discussions, allowing participants to share deeper perspectives on how gender inclusion policies shape their academic and career trajectories. This integrated approach enabled a comprehensive analysis of policy impact, linking institutional strategies to the lived experiences of women pursuing STEM education in Abuja.

Sample Size and Sampling Techniques

This study employs a multistage sampling technique to select a total of 200 female students enrolled in science, technology, engineering, and mathematics (STEM) programs at tertiary institutions in Abuja.

Multistage sampling is used to ensure a systematic and representative selection process that captures variations across institutions and academic levels.

In the first stage, two major tertiary institutions offering accredited STEM programs in Abuja were purposively selected: the University of Abuja and the African University of Science and Technology (AUST). These institutions were chosen based on their program diversity, student population, and proximity to national gender policy centers.

In the second stage, relevant STEM faculties or departments (e.g., engineering, computer science, biological sciences, mathematics) were identified within each institution.

In the third stage, a stratified random sampling technique was used to select female students across different levels of study (undergraduate and postgraduate). From each institution, 100 respondents were selected, bringing the total sample size to 200. This distribution ensures adequate representation across disciplines and academic levels, thereby enhancing the generalizability and reliability of the study's findings.

Data Collection

The primary instrument for data collection in this study was a structured questionnaire, specifically designed to gather detailed information from female STEM students in selected tertiary institutions in Abuja. The questionnaire was administered to a representative sample of 200 students, with each session lasting approximately 45–60 minutes to allow adequate time for thoughtful responses. To ensure the tool's validity and reliability, a pilot study was conducted with a small group of female STEM students not included in the main sample. This pre-test enabled the identification of ambiguities and helped refine the structure and wording of questions to improve clarity, relevance, and alignment with the study's objectives. Based on the feedback received, necessary adjustments were made before full deployment. Additionally, trained research assistants were engaged to administer the questionnaire in-person, assisting respondents in interpreting questions accurately and ensuring the consistency and accuracy of responses across different academic levels and institutions.

Data Analysis

The data collected for this study were analyzed using a combination of descriptive and inferential statistical methods, tailored to address each of the study's specific objectives. Descriptive statistics such as frequencies, percentages, and means were employed to analyze Objective (i) and (ii). Objective (iii) was analyzed using a Structural Equation Modelling (SEM) to determine the strength and significance of relationships between explanatory variables and factors influencing young girls' interest in STEM careers. To assess Objective (iv), a 4-point Likert scale was used. For Objective (v), Kendall's Coefficient of Concordance (W) was used to rank and assess the level of agreement among respondents regarding the severity of identified challenges. All statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences), Version 24, ensuring robust and systematic data handling.

Model Specification: Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) was employed to analyze the socio-economic factors influencing young girls' interest in STEM careers. The model comprises two components: a measurement model, which defines the relationships between latent constructs and their observed indicators, and a structural model, which specifies the causal paths between constructs.

Latent variables included socio-economic status (SES), parental support, and cultural perception. Each was measured through indicators such as household income, parental education, encouragement, financial support, perceived gender roles, and exposure to female role models. These were linked to the outcome variable—interest in STEM careers.

The structural model is represented as:

$$\eta = \gamma 1 \cdot \xi 1 + \gamma 2 \cdot \xi 2 + \gamma 3 \cdot \xi 3 + \zeta$$

Where η is interest in STEM; $\xi 1$, $\xi 2$, and $\xi 3$ represent the variables influencing young girls' interest in STEM careers; and ζ is the error term.

Likert Scale Model for Analysis

In this study, a **4-point Likert scale** was employed to measure respondents perceived impact of gender inclusion policies. This rating scale allowed participants to express the **extent of agreement** with specific items concerning institutional support, access to opportunities, and perceived policy effectiveness.

The Likert scale was structured as follows:

- Strongly Agree (SA) – 4
- Agree (A) – 3
- Disagree (D) – 2
- Strongly Disagree (SD) – 1

A **mean score of 2.5** was used as the decision threshold. Any mean value **equal to or above 2.5** was interpreted as a **positive or substantial extent** of agreement, while values **below 2.5** were considered low or negligible.
The Likert mean score was calculated using the formula:

$$X_s = \frac{\sum fn}{Nr}$$

Where:

- X_s= Mean Likert score
- Σ = Summation symbol
- $\sum fn$ = Sum of the products of frequency and assigned Likert value

- Nr = Total number of respondents

Kendall's Coefficient of Concordance (*W*)

To address **Objective (v)**—which aims to examine the barriers hindering women's participation in science and technology—Kendall's Coefficient of Concordance (*W*) was employed. The rank totals for each barrier were analyzed using Kendall's W, which produces a coefficient between 0 (no agreement) and 1 (perfect agreement). A higher W value indicates strong consensus among respondents regarding which barriers are most impactful.

The formula used for Kendall's W is:

$$W = \frac{12\sum(R_i - \bar{R})^2}{m^2\,(n^3 - n)}$$

Where:
W = Kendall's Coefficient of Concordance
R_i = Sum of ranks for each challenge
$\bar{R}$= Mean of the ranks
m = Number of respondents
n = Number of challenges ranked

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Women in Science and Technology

The majority of respondents (44%) were between 23–27 years, with a mean age of 25.9. This indicates that most women in STEM in Abuja are in early adulthood, a formative period for academic and career development. The age pattern reflects similar findings by Olatunji and Akinyele (2020), who observed that younger women dominate university-level STEM fields, often before marriage and other life transitions that impact educational continuity.

Most respondents (65%) were undergraduates, while 35% were postgraduates. This suggests a concentration of women at the entry-level phase of STEM education, echoing Eze (2019), who noted a sharp drop-off in female representation at higher academic tiers. The data indicate that while many women are entering STEM programs, fewer persist to advanced study or research careers, likely due to structural and cultural constraints.

A dominant share (76%) of respondents were single. The prevalence of single participants may reflect the prioritization of education and early career development before marriage. Agboola and Olayemi (2021) argue that marital responsibilities often conflict with women's ability to persist in STEM, particularly in environments with weak institutional support for work–life balance.

Engineering and technology (30%) had the highest representation, followed by life sciences (28%), physical sciences/mathematics (24%), and computer science/ICT (18%). The relatively strong presence in engineering contrasts with older gender stereotypes, while the lower figure in ICT aligns with UNESCO (2019), which reported fewer women in computing due to digital gender gaps.

Over half (51%) of the respondents had parents with tertiary education. This supports findings by Oladosu *et al*. (2020), who showed that parental education is a significant enabler of girls' entry into STEM, influencing early exposure, encouragement, and access to quality schooling.

Most respondents reported monthly household incomes between ₦50,000 and ₦200,000, with a mean of ₦118,500. This reflects a lower-middle-income demographic, with possible implications for access to educational resources. Oluwole (2020) notes that women from lower-income households are more vulnerable to STEM dropout due to financial constraints, which may include difficulty affording materials, transportation, or unpaid internships.

A majority (63%) of participants were from urban parts of Abuja, while 37% lived in peri-urban or suburban areas. It also highlights a geographic disparity, where women in remote areas face limited exposure to science-based education and fewer institutional supports (Federal Ministry of Women Affairs, 2023).

Only 19% of respondents were employed full-time, while 38% were not seeking employment (primarily students), 20% were unemployed but actively seeking, and 23% were part-time/self-employed. The data reflect a transitional population—mainly students or early-career professionals—underscoring the gap between STEM education and labour market entry, as noted by the World Bank (2019).

Slightly over half (51%) of respondents reported lacking access to STEM mentorship. This aligns with Akinola and Oludayo (2021), who emphasized mentorship as a critical factor in improving women's retention and success in STEM. The nearly equal split in access points to uneven institutional efforts and a need for structured mentoring programs to support female students' progression.

Table 1: Socio-Economic Characteristics of Rural Farmers (n = 200)

Variable	Freq (n = 200)	Percent
Marital status		
Single	152	76.0
Married	46	23.0
Widowed/Divorced	2	1.0
Educational level		
Undergraduate	130	65.0
Postgraduate	70	35.0
Age (Mean = 25.9 yrs)		
18 – 22 years	52	26.0
23 – 27 years	88	44.0
28 – 32 years	42	21.0
33 and above	18	9.0
Discipline		
Engineering and Technology	60	30.0
Life Sciences (Bio/Health)	56	28.0
Physical Sciences and Mathematics	48	24.0
Computer Science/ICT	36	18.0
Parental Education Level		
No formal education	20	10.0
Primary/Secondary education	78	39.0
Tertiary education	102	51.0
Monthly Household Income		
Below ₦50,000	38	19.0
₦50,000–₦100,000	66	33.0
₦101,000–₦200,000	58	29.0
Above ₦200,000	38	19.0
Geographic Region		
Urban (City Center/Metropolitan)	126	63.0
Peri-Urban/Suburban	74	37.0
Employment Status		
Full-time employed	38	19.0
Part-time/self-employed	46	23.0
Unemployed (actively seeking work)	40	20.0
Not seeking employment (students)	76	38.0
Access to STEM Mentorship		
Yes	98	49.0
No	102	51.0

Source: Field Survey, 2025

Extent of Women's Participation in Science and Technology Fields Across Educational and Professional Levels

A significant 94% of respondents reported current enrollment in STEM-related undergraduate or postgraduate programs. This high percentage reflects growing access to formal science and technology education among women in Abuja. It aligns with broader trends of increased female enrollment in tertiary STEM fields in Nigeria (Eze, 2019).

Participation in science and technology-related extracurricular events such as competitions, conferences, and workshops was reported by 62% of the respondents. Engagement in such activities suggests that many women are gaining exposure to knowledge-sharing platforms outside traditional classroom settings (Agboola and Olayemi, 2021).

Fifty-eight percent (58%) of the respondents indicated that they had completed internships or industrial training programs in science and technology fields. This represents a moderate level of practical engagement with the STEM workforce. Oluwole (2020) noted that limited industry placements for women may contribute to slower transition from academic settings into professional environments, often due to gendered assumptions about technical competence.

Just over half of the respondents (51%) reported active involvement in research, laboratory experiments, or innovation projects. This finding suggests that while a considerable number of women are accessing research opportunities, a substantial proportion remains disengaged from these essential components of STEM education (Oladosu *et al*., 2020).

A smaller proportion of respondents (19%) had published or contributed to scientific papers, journal articles, or technical reports. This low level of academic publishing reflects broader issues of research access, writing support, and mentorship availability. For many students, particularly at the undergraduate level, publishing remains an intimidating or inaccessible process (Akinola and Oludayo, 2021).

Forty-two percent (42%) of participants stated that they had held leadership positions in science or technology-focused student organizations. This finding reveals a moderate level of engagement in leadership roles, which are critical for developing managerial skills, institutional voice, and confidence in decision-making. However, the fact that a majority of respondents have not held leadership positions may be indicative of systemic exclusion, lack of opportunity, or self-doubt in competitive academic environments (Oladosu *et al*., 2020).

Regarding professional engagement, 48% of respondents indicated that they had applied for or secured employment in a science or technology-related organization. This figure suggests that nearly half of the female respondents are already transitioning into or engaging with professional STEM sectors. While this indicates growing ambition and participation, the remaining 52% without such exposure may face structural barriers such as limited internship-to-employment pipelines, lack of industry networking, or implicit bias in hiring practices. These factors continue to shape women's trajectories in science and technology careers (World Bank, 2019).

Finally, 29% of respondents reported that they had mentored or supported other female students in STEM through formal or informal channels. The relatively low participation in mentoring activities may reflect the absence of structured programs, a shortage of senior female mentors, or a lack of institutional emphasis on collaborative learning (UNESCO, 2019).

Table 2: Level of Awareness and Understanding of Biotechnology among Smallholder Cowpea Farmers

Statement	Frequency (f)	Percentage (%)
I am currently enrolled in a STEM-related undergraduate or postgraduate program.	188	94.0%
I have participated in at least one science or technology-related competition or conference.	124	62.0%
I have completed an internship or industrial training in a science or technology field.	116	58.0%
I am actively involved in research, laboratory work, or innovation projects in STEM disciplines.	102	51.0%
I have published or contributed to a scientific paper, journal article, or technical report.	38	19.0%
I hold or have held a leadership position in a science or technology student organization.	84	42.0%
I have applied for or secured employment in a science or technology-related organization.	96	48.0%
I have mentored or supported other female students in STEM through formal or informal channels.	58	29.0%

Source: Field Survey, 2025

Multiple Responses

Factors Influencing Adoption of Biotechnology among Smallholder Cowpea Farmers

The model fit indices in Table 3 indicate an acceptable and robust fit for the structural equation model. The chi-square statistic ($\chi^2 = 127.43$, df = 89, $p < 0.001$) suggests significance, though chi-square is sensitive to sample size. The RMSEA value of 0.051, with a 90% confidence interval of [0.038, 0.064], falls within the acceptable range. Additionally, CFI (0.923), TLI (0.908), and SRMR (0.047) all indicate good model fit, supporting the model's adequacy in explaining variance in STEM interest.

Age group was found to have a significant positive influence on young girls' interest in STEM careers ($\beta = 0.187$, $p < 0.001$). This suggests that as respondents grow older, their engagement and interest in science and technology fields tend to increase. This aligns with findings by Olatunji and Akinyele (2020), who observed that cognitive maturity and academic exposure heighten awareness and motivation toward long-term STEM pathways.

Level of education significantly predicted interest in STEM careers ($\beta = 0.342$, $p < 0.001$). Higher educational attainment was associated with increased STEM interest, reinforcing the idea that extended exposure to academic content and supportive learning environments fosters greater enthusiasm and commitment (UNESCO, 2019).

Marital status showed no significant influence on STEM interest ($\beta = -0.089$, $p = 0.184$). Though literature often links marriage to reduced academic and career engagement among women (Agboola and Olayemi, 2021), this study's finding suggests that marital status may not be a decisive factor among young female STEM students in Abuja.

Monthly household income had a statistically significant and positive effect on interest in STEM ($\beta = 0.245$, $p < 0.001$). Respondents from higher-income households were more likely to express sustained interest in STEM careers. This supports Oluwole's (2020) assertion that socio-economic background directly affects access to learning resources, quality education, and aspirational development.

Geographic region was also a significant predictor ($\beta = 0.156$, $p = 0.005$), indicating that girls living in more central or urbanized areas exhibited greater interest in STEM. This is consistent with Federal Ministry of Women Affairs (2024), which highlights disparities in STEM access between urban and peri-urban settings.

Employment status did not significantly influence STEM interest ($\beta = 0.078$, $p = 0.179$). Although practical work experience can shape career aspirations, this finding suggests that employment status—whether part-time, unemployed, or student—has limited effect on the intrinsic interest of young women in STEM. This contrasts slightly with World Bank (2019), which argues that early career exposure is critical, but it may be that students prioritize academic goals over immediate job status.

Access to STEM mentorship had the strongest positive effect on interest in STEM careers (β = 0.428, $p < 0.001$). Respondents with mentorship opportunities showed significantly higher levels of STEM engagement. This supports findings by Akinola and Oludayo (2021), who emphasized the role of mentorship in increasing retention and confidence among women in science.

Table 3: Structural Equation Modelling Results – Socio-Economic Factors Influencing Young Girls' Interest in STEM Careers

Variable	Standardized Coeff. (B)	Standard error	t-value	Sig. (p-value)	95% CI
Age Group (Years)	0.187	0.052	3.596	0.000***	[0.085, 0.289]
Marital Status	-0.089	0.067	-1.328	0.184	[-0.220, 0.042]
Educational Level	0.342	0.048	7.125	0.000***	[0.248, 0.436]
Monthly Household Income	0.245	0.061	4.016	0.000***	[0.125, 0.365]
Geographic Region	0.156	0.055	2.836	0.005**	[0.048, 0.264]
Employment Status	0.078	0.058	1.345	0.179	[-0.036, 0.192]
Access to STEM Mentorship	0.428	0.041	10.439	0.000***	[0.348, 0.508]
Chi-square (χ^2)	127.43 (df = 89), $p < 0.001$				
RMSEA	0.051 [90% CI: 0.038, 0.064]				
CFI	0.923				
TLI	0.908				
SRMR	0.047				
R^2 (STEM Interest)	0.647				

Note: ***, ** and * indicate significance at 1% and 5% probability level respectively
Source: Field Survey, 2025

Perceptions of the Impact of Gender Policies on Women's Inclusion in STEM

A total of 80% of respondents agreed that gender policies have improved access to STEM education, yielding a mean score of 3.18. This supports the idea that policy interventions are recognized as effective entry facilitators. According to UNESCO (2019), national gender equity strategies have significantly enhanced access to science and technology education for women in developing countries, including through affirmative action and institutional support frameworks.

Sixty-five percent of respondents acknowledged benefits from gender-specific STEM programs introduced through policy, producing a 2.97 mean score. This indicates moderate to strong perceived impact of such programs. Agboola and Olayemi (2021) argue that access to government-funded scholarships, training workshops, and awareness campaigns are key drivers of women's participation in technical fields, especially where targeted to underrepresented groups within tertiary institutions and research sectors.

Just over half of respondents (52%) agreed that gender inclusion policies are well-implemented and monitored institutionally, with a borderline mean of 2.55. Oluwole (2020) emphasized that effective implementation of gender frameworks is often hindered by institutional inertia and lack of administrative accountability, particularly in decentralized university systems where oversight mechanisms remain weak or informal.

Only 43% of respondents affirmed improved female representation in STEM leadership due to gender policies, with a mean score of 2.36. This suggests limited visibility of women in decision-making roles. As Oladosu *et al*. (2020) observed, despite policy commitments, gender disparities persist in academic governance, where senior positions are disproportionately occupied by men, especially within engineering, physical sciences, and technology-related faculties.

Perceptions of institutional culture shifting in support of women in STEM were largely negative, with a 2.49 mean score. While 48% agreed, 52% disagreed, indicating weak internalization of inclusion values. Akinola and Oludayo (2021) noted that policies often fail to change entrenched patriarchal attitudes, making institutional transformation difficult without parallel efforts in awareness training and cultural reorientation within academic environments.

A majority of respondents (74%) expressed awareness of national gender-inclusion policies promoting women in STEM, with a 3.04 mean score. Eze (2019) asserts that high policy visibility correlates with better participation outcomes, especially when institutions disseminate and localize policy content through orientations, student advocacy platforms, and dedicated gender units within faculties or departments.

Sixty percent of respondents agreed that mentorship and networking opportunities have improved through gender policies, resulting in a mean score of

2.72. This indicates modest but meaningful institutional progress. UNESCO (2019) emphasized that mentorship remains one of the most effective interventions for sustaining women's interest in STEM, improving academic confidence, and reducing dropout rates, particularly when peer and faculty mentors are female.

A combined 65% of respondents believe gender inclusion policies are mostly symbolic, yielding a 2.79 mean score. This critical perspective suggests skepticism about practical outcomes. Oluwole (2020) argued that without robust implementation, policies become performative especially where institutional leadership fails to align action with documented commitments, leading to persistent inequalities despite formal equality narratives.

Table 4: Perceptions of the Impact of Gender Policies on Women's Inclusion in STEM

Statements	Strongly Agree (4)	Agree (3)	Disagree (2)	Strongly Disagree (1)	Mean Score (Xs)	Decision
Gender policies in my institution have improved women's access to science and technology education.	88 (44.0%)	72 (36.0%)	28 (14.0%)	12 (6.0%)	3.18	ACCEPTED
I have benefited from gender-specific programs or opportunities introduced through national STEM policies.	62 (31.0%)	86 (43.0%)	36 (18.0%)	16 (8.0%)	2.97	ACCEPTED
Gender inclusion policies are well-implemented and actively monitored in my institution.	44 (22.0%)	60 (30.0%)	58 (29.0%)	38 (19.0%)	2.55	ACCEPTED
There is visible female representation in leadership positions within STEM institutions due to gender policies.	36 (18.0%)	50 (25.0%)	64 (32.0%)	50 (25.0%)	2.36	REJECTED
Institutional culture supports women in STEM as a direct result of gender inclusion policies.	40 (20.0%)	56 (28.0%)	66 (33.0%)	38 (19.0%)	2.49	REJECTED
I am aware of specific government policies aimed at increasing women's participation in STEM.	78 (39.0%)	70 (35.0%)	34 (17.0%)	18 (9.0%)	3.04	ACCEPTED
Gender policies have improved mentorship and networking opportunities for female STEM students.	52 (26.0%)	68 (34.0%)	52 (26.0%)	28 (14.0%)	2.72	ACCEPTED
I believe gender inclusion policies are merely symbolic and lack real impact on women's STEM advancement.	60 (30.0%)	70 (35.0%)	38 (19.0%)	32 (16.0%)	2.79	ACCEPTED

Source: Field Survey, 2025

Barriers Hindering Women's Participation in Science and Technology

The ranking of barriers hindering women's participation in science and technology, as analyzed using Kendall's Coefficient of Concordance ($W = 0.712$, $\chi^2 = 996.84$, $p < 0.001$) in Table 5, reveals a high level of agreement among respondents on key constraints. The most strongly perceived barrier was gender stereotypes and societal expectations, with the highest mean rank (6.87). This indicates that cultural norms and traditional gender roles remain deeply embedded and continue to discourage women from pursuing or persisting in STEM careers. This finding aligns with UNESCO (2019), which underscores the enduring influence of social perceptions on female underrepresentation in technical fields.

The second most prominent barrier was the lack of visible female role models and mentors in STEM (mean rank = 6.12). This reinforces studies such as Akinola and Oludayo (2021), which highlight the motivational power of mentorship in female retention and progression in science. Closely following were limited access to research funding and technical resources (mean rank = 5.93) and institutional bias and male-dominated environments (mean rank = 5.67), both pointing to structural inequalities and gendered resource allocation within academic and professional settings.

Barriers like family responsibilities, early STEM exposure, and harassment in STEM settings were also acknowledged but ranked lower, suggesting variability in their perceived severity. Low confidence in STEM competencies was the least ranked (3.74), though still notable. Collectively, these results illustrate a complex interplay of cultural, structural, and psychological challenges that must be addressed to enhance women's full participation in science and technology fields in Nigeria.

Table 5: Ranking of Barriers Hindering Women's Participation in Science and Technology Using Kendall's Coefficient of Concordance

Barrier Statement	Mean Rank	Rank Position
I believe that gender stereotypes and societal expectations discourage women from pursuing careers in science and technology.	6.87	1st
The lack of visible female mentors and role models in STEM fields limits women's aspirations and career persistence.	6.12	2nd
Limited access to research funding, laboratory facilities, and technical resources hinders women's effective participation in STEM.	5.93	3rd
Institutional biases and male-dominated academic or workplace cultures discourage women's inclusion in science and technology.	5.67	4th
Balancing family responsibilities with academic or career demands presents a major obstacle for women in STEM.	5.11	5th
Inadequate early exposure to STEM subjects and hands-on learning experiences affects girls' interest in science and technology.	4.78	6th
Harassment, intimidation, or gender-based discrimination in academic or professional STEM settings deter female participation.	4.23	7th
Low confidence or poor self-perception in science and technology competencies negatively affects women's participation in STEM fields.	3.74	8th
Kendall's Coefficient of Concordance (W) Summary		
Chi-square (χ^2) = 996.84		
Kendall's W (calculated) = 0.712		
Significance level = $p < 0.001$		

Source: Field Survey, 2025

CONCLUSION AND RECOMENDATIONS

This study examined the impact of gender inclusion policies on women's participation in science and technology in Abuja, Nigeria. The investigation spanned socio-economic profiling, participation levels, modelling of influential factors, policy perceptions, and ranking of barriers, providing a comprehensive analysis of the institutional and structural dimensions of women's involvement in STEM.

The analysis of socio-economic characteristics showed that most respondents were young (mean age = 25.9), with 44% aged 23–27. A majority (65%) were undergraduates, and 76% were single. Respondents were primarily enrolled in engineering and life sciences. Parental tertiary education was reported by 51%, while the average household income was ₦118,500. Only 19% were fully employed, and 51% reported no access to STEM mentorship, indicating gaps in professional support and economic capital.

On the extent of participation, 94% of women were enrolled in STEM programs, while 62% had attended science-related events and 58% had completed internships. However, only 19% had published academic work and 29% reported mentoring others. Leadership roles were held by 42%, and 48% had STEM-related employment experience. These results suggest strong academic entry but declining participation at higher professional levels.

Structural Equation Modelling (SEM) identified five significant predictors of STEM interest: access to mentorship ($\beta = 0.428$, $p < 0.001$), level of education ($\beta = 0.342$, $p < 0.001$), monthly household income ($\beta = 0.245$, $p < 0.001$), age group ($\beta = 0.187$, $p < 0.001$), and geographic region ($\beta = 0.156$, $p = 0.005$). Marital status and employment status were not significant. The model fit was strong ($R^2 = 0.647$, RMSEA = 0.051, CFI = 0.923).

On the impact of gender policies, six out of eight statements were positively rated, including access improvement (mean = 3.18), mentorship support (2.72), and policy awareness (3.04). However, institutional culture (2.49) and leadership representation (2.36) were rated below the 2.5 threshold, suggesting weak transformation in organizational practice despite policy visibility.

For barriers to participation, Kendall's Coefficient of Concordance ($W = 0.712$, $p < 0.001$)

showed strong agreement among respondents. The most significant barriers were gender stereotypes (mean rank = 6.87), lack of female mentors (6.12), and limited research access (5.93). The least ranked barrier was low self-confidence (3.74), indicating structural factors were perceived as more pressing than individual-level issues.

Based on the findings of the study, here are recommendations, derived from the data and analysis:

1. With low representation of women in leadership roles (mean = 2.36), higher institutions and research centers should create targeted leadership training, mentorship, and succession plans to support women's advancement into decision-making positions in STEM fields.
2. Access to mentorship significantly influenced interest in STEM ($\beta = 0.428$, $p < 0.001$). Institutions should develop formal mentorship programs pairing female students with experienced women in science, academia, and industry to foster sustained engagement and career progression.
3. Given that gender stereotypes ranked as the top barrier (mean rank = 6.87), educational curricula at primary, secondary, and tertiary levels should integrate gender-sensitive STEM content, while public campaigns should challenge harmful stereotypes about women's capabilities in science and technology.
4. Limited access to research funding and technical resources was ranked third among barriers. Government and donor agencies should allocate designated grants, research opportunities, and laboratory access to female students to level the playing field in STEM engagement.
5. With institutional culture perceived negatively (mean = 2.49), universities and workplaces should promote inclusive practices through gender equity training, anti-discrimination policies, and recognition programs that actively support female STEM students and professionals.

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