

The Underrepresentation of Women in STEM Research in Afrika* – Can Nego-Feminism Offer a Solution?

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Introduction

The Nigerian novelist Chinua Achebe once said, “There is that great proverb – that until the lions have their own historians, the history of the hunt will always glorify the hunter” (Achebe, 1958). In other words, the perspective of the storyteller affects the story being told. Reflecting on this idea, we consider how most research and narratives around gender inequalities in STEM come from the Global North.

Specifically, we seek to address the underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM) in the Afrikan context, which begins with our intentional spelling of ‘Afrika’ (Madhubuti, 1979). Throughout the continent, ‘Afrika’ is spelt with a ‘k’; the introduction of the letter ‘c’ represents the global dispersion of Afrikans, which is frequently linked to a loss of Afrikan identity. Colonialist and patriarchal systems have contributed to this loss of identity, and we highlight the importance of considering these influences when considering gender equity in STEM. Using the ‘k’ spelling is a deliberate choice to reclaim agency and acknowledge the significant contributions Afrikan women make in the 21st century.

Why focus on STEM? STEM fields have become integral to global and economic prosperity (Olaitan & Mavuso, 2022). STEM fields attract researchers, problem solvers and professionals who advance critical aspects of life,

such as education, health, security and others. However, as highlighted by this collection, gender parity in STEM fields remains skewed (Blackburn, 2017; Bloodhart et al., 2020; Kahn & Ginther, 2017). Studies investigating this phenomenon show that stereotyping, as well as institutional and systemic biases, are among the factors contributing substantively to women's underrepresentation (Bloodhart et al., 2020; Nakayiwa et al., 2020; Odaga, 2020; Siwale et al., 2023). However, research investigating women in STEM originates in the Global North and limited input can be found from the Global South (Prozesky & Mouton, 2019; Siwale et al., 2023).

We reiterate ideas shared throughout this collection, highlighting how the body of research from Afrika suggests that gender stereotyping from an early age has meant that girls and young women have not been encouraged to pursue careers in STEM (CHE, 2016; Mbirianjau et al., 2019; Odaga, 2020). For example, in Kenya's public universities, women's enrolment is approximately 30% (Mbirianjau et al., 2019). The 2020 study by The Afrikan Academy of Sciences, comprising Afrikan countries sub-Saharan, showed the percentage of women graduates in STEM stood at 12% (The AAS, 2020).

Even more concerningly, in a World Economic Forum blog, the projected year for closing the gender gap (STEM inclusive) was moved from 2095 to 2133 (Harry, 2018); suggesting that efforts towards gender equality are moving more slowly than expected. The delay in achieving gender equality has far-reaching impacts, from economic growth to social implications, but also a mental and emotional impact on women themselves. This 38-year delay should act as a call to re-examine efforts and investigate potentially ineffective policies.

The previous chapters of this collection, through the diverse perspectives shared and contexts explored, seek to address the lack of Global South voices contributing to conversations around gender equality in STEM. Conversely, the current chapter looks to highlight alternative pathways through which we might interrogate the issue. More specifically, we consider how Afrikan perspectives can address the underrepresentation of women in STEM on the Afrikan continent. There is, to date, a lack of literature originating in Afrika, that discusses and conceptualises gender inclusion with an awareness of cultural nuances. This is despite the continent's diverse cultural heritage, which encompasses relevant principles such as ubuntu and Afrikan feminism (Cruz, 2016; Menon, 2022).

Ubuntu is an Afrikan philosophy rooted in communal interdependency. It engages with social justice, interdependence, empathy as well as collaboration and compassion (Ewuoso & Hall, 2019). By reflecting on togetherness, ubuntu provides an opportunity to reflect on Afrikan culture (Ewuoso & Hall, 2019;

Menon, 2022). Afrikan feminism aligns with the philosophy of ubuntu (Cruz, 2016) and provides a nuanced approach to addressing gender disparities in STEM using Southern theory. Understanding the Afrikan approach and its nuances (Prozesky & Mouton, 2019; Siwale & Mwalemba, 2023) can help chart a course towards specific targeted actions that could be effective in an Afrikan context.

Existing Afrikan literature highlights the experiences of women in STEM fields (see Chapter 9 for a scoping review of literature on gender disparities in undergraduate learning in sub-Saharan Africa). Gender biases within structural inequalities significantly contribute to the challenge of the leaky pipeline in STEM (Siwale & Mwalemba, 2023; The AAS, 2020). The absence of role models and limited funding opportunities hinder women's advancement (Nakayiwa et al., 2020; Olaitan & Mavuso, 2022). Insufficient digital access is compounded by low infrastructure availability, including mobile broadband, internet connectivity and power supply limitations, impacting women's educational opportunities and skill development in STEM fields, including information and communication technology (ITU, 2019; The AAS, 2020). Education disparities are evident in inadequate learning infrastructure, lack of teaching materials and shortages of skilled teachers, affecting enrolment and retention rates in STEM fields (UNESCO, 2020). Research output in STEM is influenced by the scarcity of women academics and researchers, emphasising gender imbalances in scholarly contributions. Women's family responsibilities impede their career progress, while insufficient social capital limits women's leadership roles, resulting in underrepresentation and an underrepresentation of women in influential positions (Mbirianjau et al., 2019; Nakayiwa et al., 2020; Siwale & Mwalemba, 2023).

Understanding gender stereotypes and biases in science through an Afrikan feminist framework

To contextualise Afrikan women's experiences, it is worth considering the framing typically used when discussing gender inequalities, including by UNESCO (2024) and IDRC: *dismantling gender stereotypes and biases in science*. The term 'dismantling' reflects a call to conflict, which is challenging in a context where community is understood as supportive. When terms such as 'dismantling' are used, the understanding and discourse about gender representation in STEM in Afrika can feel threatening or intimidating, contradicting the sense of togetherness that underlies much of the Afrikan philosophy of ubuntu and Afrikan feminism. Challenging gender bias or stereotypes often has a negative,

even combative connotation. Nnaemeka (2004) aptly captures it this way: “you cannot mobilise a movement that is only and always against; you must have a positive alternative”.

To unpack the concept of stereotype and what it means for Afrikan women, it is pertinent to factor in and value contexts and experiences that are rooted in a sense of community, togetherness and complementary shared roles, which may be at odds with the Global North’s feminism of competitiveness and individualism (Biwa, 2021; Cruz, 2016; Nnaemeka, 2004). The sense of complementarity is typified in the writings of Afrikan feminists who highlight that Western and Afrikan feminism are not contradictory theories; such contributions often identify the nuances of both theories and then suggest ways to go forward, respectfully engaging in scholarship (Akin-Aina, 2011; Cruz, 2016). Similarly, Afrikan feminism acknowledges the roles of all people and organisations as allies in coming up with solutions to problems that Afrikan women face.

Afrikan women are not problems to be solved. Like women everywhere, Afrikan women have problems. More important, they have provided solutions to these problems. We are the only ones who can set our priorities and agenda. Anyone who wishes to participate in our struggle must do so in the context of our agenda. In the same way, Afrikan women who wish to contribute to global struggles (and many do) should do so with a deep respect for the paradigms and strategies that people of those areas have established. In our enthusiasm to liberate others, we must not be blind to our own enslavement. Activities of women globally should be mutually liberating. (Nnaemeka, 2005, p. 57)

Nnaemeka (2005) highlights that Afrikan women have the solutions to their problems and those who would like to partner in resolving those problems must align with their agenda. In her seminal article “Nego-feminism: Theorising, practicing and pruning Afrika’s way”, she advocates the feminism of negotiation (nego-feminism) as an agency to go around the patriarchal landmines such as negative stereotypes as well as detonate them respectfully with little to no casualties in an Afrikan-centric way.

First, nego-feminism is the feminism of negotiation; second, nego-feminism stands for ‘no ego’ feminism. In the foundation of shared values in many Afrikan cultures are the principles of negotiation, give and take, compromise and balance. Afrikan feminism[s]

(or feminism as I have seen it practiced in Afrika) challenges through negotiations and compromise. It knows when, where, and how to detonate patriarchal land mines; it also knows when, where, and how to go around patriarchal land mines". (Nnaemeka, 2004, p. 376–378)

When using *role models* to *dismantle* gender stereotypes, the danger is one of aesthetics. Aesthetics relegate social action and promote egocentrism and individualism above collective action (Nnaemeka, 2004). In the Afrikan context, the function of role models is to benefit the collective and not to promote some hidden agenda. What are the driving forces of role modelling as a form of agency for *dismantling* gender stereotypes? According to an Afrikan feminism of negotiation, the term *role model* requires a collective engagement to define role models in the Afrikan context to promote a communal discourse about the role of such *role models* in *dismantling gender stereotyping*, particularly women in STEM fields. The superficial studies of Afrikan women need to go deeper as Nnaemeka (2004, p. 364) states: "Afrikan studies' focus on the idea of Afrika rather than the reality of Afrika mimics women's studies' foregrounding of the notion of the Afrikan woman rather than the humanity of Afrikan women." The challenge put to us is to reflect on how we identify role models and to challenge ourselves in seeking role models. In other words, we must ensure we are not defining role models based on male or Global North norms. Instead, our role models should represent success as defined by Afrikan women. Some questions to wrestle with while seeking to use the agency of role models are:

- Is it possible to have/raise role models at diverse stages of life – from childhood to adulthood, covering different educational and career stages?
- How can structures be put in place that promote raising role models?
- What would be the best or appropriate ways/approaches/strategies to develop these structures?
- How can these structures be sustained?
- What tools would be needed in building such systems that should produce role models?
- What technologies can be leveraged in (the system of) raising role models?
- How will these technologies be developed to ensure that Afrikan women benefit optimally?

These are pertinent questions to consider to effectively *dismantle gender stereotypes* using role models. These questions go beyond the aesthetics of showcasing a role model and reflect the true nature of Afrikan engagement. By asking

these questions through the lens of gender-awareness combined with Afrikan engagement (i.e. considering barriers faced by and perspectives of Afrikan women specifically), we can emphasise the value of creating community and intentionality when confronting the underrepresentation of women in STEM. Indeed, role models are not the only way to dismantle gender stereotypes. An initiative that may serve as an example of intentionality and creating a community is the Forum for Afrikan Women Vice Chancellors (FAWoVC); among its responsibilities is included mainstreaming gender within higher education institutions through “spearhead[ing] gender responsive training in higher education institutions and ... increase[ing] the enrolment of female students in ... STEM” (Nakayiwa et al., 2020, p. 66).

To engage more appropriately in questions of gender, stereotypes and biases, we must enhance our own gender-awareness and in doing so, our ability to go beyond a superficial analysis of the commonly accepted gender studies terminologies and their conclusions. By being mindful of the different perspectives and working towards a more equitable approach, a holistic comprehension of the structural and societal implications of using those terminologies will encourage sensitivity in interactions and decision-making.

Ensuring support across education and career pathways – Understanding women’s needs

Supporting women in STEM requires educational and workplace environments that actively recognise and respond to their specific needs, ensuring retention, advancement and equity across career pathways. Research has mainly reviewed unconducive work environments causing many women to exit STEM fields at various stages in their education or careers – often referred to as the leaky STEM pipeline (Mbirianjau et al., 2019; Nakayiwa et al., 2020; Siwale & Mwalemba, 2023; The AAS, 2020). The leaky pipeline, marked by systemic barriers such as discrimination, harassment and inadequate policies, continues to push women out of STEM fields at various stages (see Chapter 11 for an approach to understanding and addressing such barriers in Bolivia). Addressing these issues requires both structural reform and culturally grounded feminist approaches.

To address these persistent barriers, nego-feminism offers a culturally grounded approach to reimagining support systems for women in STEM to challenge these areas of tension through the art of negotiation and compromise. Scholars of Afrikan feminism agree on the power of negotiation in creating awareness about different parties’ needs leading to “detonating” or “charting a course around patriarchal landmines” manifested through the various

hostilities faced by women (Akin-Aina, 2011; Cruz, 2016; Nnaemeka, 2004). Nego-feminism's "third space of engagement" provides a platform for women in STEM to develop a common charter that can be used to engage with workplace leadership. As Nnaemeka (2004, p. 360) puts it, "The third space allow[s] the mediation of policy. The third space, which allows for the coexistence, interconnection and interaction of thought, dialogue, planning and action, constitutes the arena where I have witnessed the unfolding of feminisms in Afrika." In other words, the third space of engagement refers to a theoretical space that lives between the worlds of theory, policy and practice, wherein ideas can be openly shared and continuously evolving.

Within this framework, the concept of a 'third space of engagement' emerges as a powerful tool for collective action, enabling women in STEM to articulate shared needs and influence institutional policies. If educational institutions and workplaces are to become spaces where women feel welcomed and accommodated, such a space needs to be created. Otherwise, the undesired consequences become inevitable, and we continue to perpetuate the existence of uncondusive educational and workplace environments. The manifestation of systemic barriers reported in the literature has made more women become victims of the leaky pipeline. The relevance of these ideas becomes clear when examining real-world policies that disproportionately affect women, such as the study by Mbirianjau et al. (2019) examining restrictions on campus housing for pregnant students. This type of policy applies exclusively to women and leads to women dropping out of university programmes when they start families. Societal and cultural norms downplay the need for providing women with opportunities as women are perceived to be family and home caretakers (The AAS, 2020). With this notion, women's participation in STEM is threatened and undermined.

Motherhood, while culturally valued in many Afrikan contexts, often intersects with institutional policies in ways that disadvantage women in STEM. This duality, where motherhood confers social respect but also institutional penalties, highlights the need for policy reform that aligns with cultural realities. Cruz (2016) highlighted the agency of socialisation through motherhood as a way for women to gain visibility. In the Afrikan sense, motherhood comes with a substantial benefit which includes status, respect and a sense of being valued (Cruz, 2016). Research suggests women are challenged with weighing the costs and benefits of motherhood when making decisions about their educational or career trajectories. Many women ascend to the peak of their careers during childbearing ages, which leaves women to choose between their career and family; most forfeit their career to raise a family (Nakayiwa et al., 2020; Odaga, 2020; Siwale et al., 2023; The AAS, 2020; Thornton, 2019). There is an

additional punitive aspect of motherhood in certain, often male-dominated, spaces, including STEM fields. For example, in Kenyan public universities, pregnant women are given penalties like losing on-campus boarding privilege (Mbirianjau et al., 2019). The cited study noted that no policy existed to support nursing mothers in university residences, leading to delayed graduation or drop-out. Contrarily, in Uganda, the affirmative action introduced in 1990 has increased the intake of female students into the university, though the corresponding outcome is yet to significantly increase the number of women taking up STEM courses (Nakayiwa et al., 2020).

In light of these disparities, scholars advocate for a gender-awareness lens to be applied to research infrastructure, curriculum and human resources to foster more inclusive environments (see a detailed discussion in Chapter 1). There is a need to urgently put policies in place that will address “the perceptions and stereotypes about the performance and participation of females in the ST&I [Science, Technology and Innovation] realm and workplace”, and “policy engagement and advocacy should target the socio-cultural, technological and financial aspects that will narrow the gender [gaps] in education, ST&I as well as technical and leadership positions” (Nakayiwa et al., 2020, p. 85).

Beyond policy reform, it is essential to interrogate the theoretical foundations guiding gender research in STEM, particularly when Global North perspectives dominate the discourse. Dimensions of positionality and intersectionality are crucial considerations for research on women in Afrika (Cruz, 2016; Nnaemeka, 2004). Nnaemeka (2004) remarks that positionality will bring about a reconsideration of different aspects of life such as the social, personal, political and others. Intersectionality, she argues, will bring together the ontology and evolution of being and becoming. Akin-Aina (2011) adds that continuous engagement is required to promote scholarship and praxis of Afrikan feminism and allow room for constant negotiation with evolving ‘elements of custom and tradition’ whose end goal is emancipation.

Theorising women’s underrepresentation in STEM on the Afrikan continent as a subset of gender equality using Global North methods of analysis raises important questions such as: who benefits from the theories developed? Who does the theory serve? Whose agenda is pursued? Nnaemeka (2004, p. 362) cites Lugones and Spelman (1983) to capture a crucial aspect of theory building:

Theory makers and their methods and concepts constitute a community of people and shared meanings. ... Why do we engage in this activity and what effect do we think it ought to have? As Helen Longino has asked: ‘Is “doing theory” just a bonding ritual for

academic or educationally privileged feminist women?’ Again, whom does our theory making serve?

We argue theories should be developed and used contextually and intersectionally to contribute to positive and meaningful change (Nnaemeka, 2004, p. 367). Ultimately, theories addressing gender in STEM must be rooted in Afrikan contexts, informed by intersectional realities and aimed at transformative change, not merely academic discourse. Only then can they serve the women they intend to support.

Conclusion

The pervasive influences of patriarchy and colonialism significantly shape the cultural norms prevalent across the Afrikan continent, permeating societal structures and influencing the trajectory of development, particularly within technological advancement. Within patriarchal systems, the reinforcement of binary gender constructs tends to privilege men while constraining women and non-binary individuals’ opportunities for participation and contribution in processes crucial to societal progress. The ramifications of this systemic bias have historically been overlooked and downplayed, perpetuating an ongoing cycle of inequality.

We aimed to introduce a new perspective on the narrative of women in STEM across the Afrikan continent. Exploring local perspectives on gender and social dynamics within Afrikan contexts holds critical significance for driving positive change. With this, the imperative arises to delineate what constitutes the dismantling, stereotyping, creating role models and conducive workplace environments from an Afrikan perspective. Western feminist approaches continue to navigate the historical legacies of colonialism and systemic suppression that have shaped perceptions of gender and representation in STEM. We argue that by using an Afrikan feminism of negotiation to unpack perceptions and experiences, the possibility of redefining gender norms and reimagining Afrikan STEM spaces can evolve into equitable and inclusive domains.

In conclusion, we emphasise the crucial need for a broader consideration of Afrikan perspectives in addressing the underrepresentation of women in STEM fields across the continent. Recognising that the challenges faced by Afrikan women are deeply embedded in unique socio-cultural, historical and economic contexts is vital. The application of solutions derived from the Global North often fails to resonate with the realities on the ground, leading

to ineffective approaches that overlook the invaluable insights and agency of Afrikan women themselves.

The integration of frameworks such as Afrikan feminism and the philosophy of ubuntu is essential in redefining gender norms and creating inclusive STEM environments in Afrika. These frameworks not only acknowledge the communal and relational aspects of Afrikan cultures but also promote the active participation of women in dialogues about their representation and advancement. By centring local narratives and contexts, stakeholders can better understand what it truly means to dismantle gender stereotypes and biases and how to create role models and supportive workplace environments that genuinely reflect Afrikan realities.

Moreover, the importance of engaging in gender-aware research that transcends superficial analyses cannot be overstated. This research must consider the complexities of intersectionality and positionality, allowing for a nuanced understanding of the barriers women face in STEM and the potential pathways for overcoming them. The limited visibility of role models and systemic inequalities perpetuated by cultural perceptions must be addressed through collective action, driven by the voices and experiences of women in science and technology across Afrika.

Ultimately, this chapter advocates for a shift in the global discourse surrounding gender in STEM, urging for partnerships that are respectful of Afrikan agency and aligned with local aspirations. Such an approach requires both an acknowledgement of historical injustices and a commitment to fostering environments where Afrikan women can thrive as innovators and leaders in STEM fields. It is through this paradigm shift that we can hope to achieve meaningful progress, ensuring that gender parity in STEM is not just an ideal but a reality in Afrika.

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¹ <https://sit.uct.ac.za/gejusta>

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