Research Article

Ghana Social Science Journal
2025, Vol.22 (2): 35-59

Publisher: School of Social Sciences UG

Navigating the maze: Factors influencing the career path of Ghanaian women in STEM fields.

Austin Dziwornu Ablo[1], Arnold Laryea Ofoli[1], Benedicta Yayra Fosu Mensah[2], Cynthia Addoquaye Tagoe[3*] and Charlotte Wrigley-Asante[1]

Abstract

The paper examines the factors that influence the career trajectories of Ghanaian women in leadership roles within the Science, Technology, Engineering and Mathematics (STEM) fields. Drawing on 20 in-depth interviews with women at various leadership positions in STEM fields, this paper examines the barriers to women's leadership and the strategies employed to overcome them. Grounded in the feminist epistemology of intersectionality and structuration, the paper discusses the intersection of gendered norms, institutional cultures and individual agency in shaping women's experiences in STEM. Self-efficacy, parental influence, female role models and mentors played significant roles in motivating participants to choose STEM. Pervasive gender biases, limited resources and mentorship opportunities, and patriarchal social expectations of caregiving continue to constrain women's participation and leadership in STEM fields. We argue that women who successfully navigated these barriers relied on mentorship networks and inclusive work environments. Coordinated efforts emanating from the educational sector, as well as organisational and policy reforms, are critical to dismantling structural inequalities and fostering an inclusive environment for women in STEM fields. Promoting gender equity in STEM is a matter of social justice and a strategic national development imperative in Africa.

Article History: Received 19 January 2025 Accepted 20 October 2025

Keywords: STEM, female, leadership, education, Ghana.

1 Department of Geography and Resource Development, University of Ghana, Legon.
2 Institute for Environment and Sanitation Studies (IESS), University of Ghana, Legon
3. Institute of Statistical, Social and Economic Research (ISSER), University of Ghana, Legon
***Corresponding author:** Institute of Statistical, Social and Economic Research (ISSER), University of Ghana, Legon
Email: caddoquayetagoe@ug.edu.gh

Introduction

Women's participation in economic activities is central to the structural transformation of economies (Duflo, 2012). Over the past decades, perceptions regarding women's roles have transitioned from viewing them primarily as caregivers to recognising their equal participation in productive activities (Boserup et al., 2013). Women's participation in productive activities is positively correlated with improvement in women's educational attainment (Ackah et al., 2009; Baah-Boateng et al., 2013; Klasen et al., 2020; World Bank, 2012).

Despite progress in women's educational achievement with UNICEF data in 2023 showing that approximately 122 million girls are out of school globally compared to 128 million boys, the sub-Saharan Africa region have more girls than boys out of school at every level (UNICEF, UN Women & Plan International, 2025). While there is increasing parity between men and women in the liberal arts, women continue to be underrepresented in STEM fields (Kahn & Ginther, 2017). The limited access to STEM education and training further restricts women's opportunities for entry and advancement in STEM careers and similarly the case in Ghana (Baker & Baker, 2016; Wrigley-Asante et al., 2022). Work-life balance issues, such as caregiving responsibilities, can further impede women's career progression in STEM fields (Conrad et al., 2021).

This underrepresentation in STEM is deeply rooted in societal expectations and gender stereotypes that discourage women from pursuing education and careers in STEM (Ceci et al., 2014; Oyelana et al., 2018; UNESCO, 2015). Women's participation in STEM fields is vital for innovation and fostering development to create equitable and just societies. However, gender bias affects women from an early age (Dasgupta & Stout, 2014) as many societies tend to perceive men as competent and better suited for STEM roles than women, even when they have the same qualifications and experience (Cheryan et al., 2017; Hill et al., 2010). Women typically have fewer networking and mentoring opportunities, which can impede their career advancement (Ginther & Kahn, 2014).

While much of the existing scholarship has examined women's underrepresentation in STEM from global, regional or national perspectives (see for instance UNESCO, 2015; Baker & Baker, 2016; Wrigley-Asante et al., 2022), fewer studies have explored how women in Ghana specifically navigate the structural barriers and opportunities shaping their career trajectories in STEM leadership. Furthermore, it is unclear how these women navigate these barriers into leadership positions. Focusing on Ghanaian women in various STEM fields, this paper examines strategies they deploy to navigate the barriers they face. It is argued that these women take a multifaceted approach to tackling systemic barriers, utilising mentorship networks, pursuing ongoing professional development, and advocating for policy changes that support gender equity in the workplace. By building supportive communities and sharing resources, women in STEM strengthen their voices and pave the way for future generations. Furthermore, addressing institutional biases and fostering inclusive practices within organisations are essential steps to ensure that

women can succeed in STEM careers. Creating an environment that values diversity and inclusivity will benefit women, drive innovation and foster progress in STEM fields, ultimately contributing to broader economic growth and societal advancement.

Women, work and career progression in STEM

Theorising women's STEM career

Studies have established that from birth, children begin to learn about gender roles and expectations through the type of clothes and toys that parents buy for them (Cerbara et al., 2022). Gender – a socially constructed role and relations between men and women is an ascribed status and is built through psychological, cultural, and social means (Padavic & Reskin, 2002). Consequently, children are socialised into "appropriate" gender roles and "expectations". This is evident in the stereotypes surrounding feminine gender roles, which typically orient girls to be caregivers and helpers with an emphasis on good interpersonal skills. On the other hand, there is the stereotype about masculine gender roles, which encourages boys to be agentic, curious and explorative. This socialisation process steers boys towards improved problem-solving skills, which in many ways align with Mathematics and Sciences (King et al., 2021).

Feminist geographers offer several socio-scientific conceptualisations of gender, which are critical to deconstructing the dynamics of women's careers in STEM. The first approach is to view gender as a difference, focusing on the spatial dimension of the differences between men and women across cultural, economic, political, and environmental arenas. According to Dixon and Jones III (2006, p. 46), the question of "where does work take place" has now evolved into "who works where?" This shift enables researchers to examine the spatial aspects of gendered labour divisions. The second approach is gender as a social relation, which goes beyond the simple study of men and women to a look at the social relations that link men and women in complex ways (patriarchy - social structures that work to dominate women and children). The third is gender as a social construction, which focuses on how discourses establish differences between people, aspects of meaning, experiences, landscape, and the state (Dixon & Jones III, 2006). Together, these approaches provide a basis for exploring how social structure influences the gendered behaviours that shape the careers of women in STEM fields. They help us understand how social interaction and accountability to others' expectations, thus, "doing gender" creates and reproduces inequality for women in STEM fields.

As Ridgeway (2011, p. 510) contends, gender is not merely an identity or role but "an institutionalised system of social practices for constituting people as two significantly different categories, men and women," upon which social relations are organised. Understanding Ghanaian women's careers in STEM fields is the concept related to gender roles – a set of social and behavioural norms that, within a specific culture, are widely considered socially appropriate for individuals of a specific sex. Gender roles

and differences have been noticed even among elementary school children, influencing their career trajectories (Starr & Simpkins, 2021). Here, we explore how societal attitudes about appropriate gender roles influence and perpetuate gender-differentiated opportunities and careers for women in STEM fields in Ghana. Crucially, how do rigid social expectations regarding a "woman's place" shape women's careers in STEM, and how do they navigate them? As McDowell (2011) observed, ideologies about gender-appropriate behaviour vary across space and time. In this paper, we examine how such ideologies can hinder women's careers in STEM and the resources they utilise to navigate them. Risman (2011) emphasises that social structures shape people's perceptions of their interests, which in turn influence their choices. Thus, for a woman to enter a STEM career, day-to-day social interactions and relations play a significant role.

Structuration Theory

Giddens' structuration theory is an insightful lens through which to analyse Ghanaian women's STEM experiences. This helps capture the duality of structure, where institutionalised rules (e.g., male ascendancy in organisational culture) repress women's agency, but women reproduce or transform these structures through their daily praxis.

Giddens' (1984) structuration theory suggests an inherent spatiality in social life and provides insight into the dynamics of women's careers in STEM. Giddens posits that society does not exist independently of human activity, nor is it a product of it (Holt-Jensen, 1980). There is a mutually constitutive relationship between social structures and individuals – structures shape people, and people shape structures. While people are socialised with stereotypical ideas about gender-appropriate jobs, our day-to-day actions either reinforce these ideas or correct them. A key concept in Giddens' theory is the duality of structure, which refers to the reciprocal influence that both humans and social structures have on each other. According to Holt-Jensen (2009, p. 162), "Individuals are formed by society and its institutions, but they are also skilled agents who direct their own lives through actions." Agency (human action) and social structures "are in real life knitted together by social practice." The repetition of social practices gives rise to social systems, such as schools and workplaces and since the socialisation process cannot be isolated from its outcomes, occupational segregation will be persistent. Even though the basis of gender inequality has reduced in recent times, the pattern of gender hierarchy is still persistent, placing men in more advantaged positions than women (Ridgeway, 2011; Risman, 2011). It is, therefore, essential to understand the dynamics of women's career progression in STEM fields to unravel the structures that either reinforce or disrupt their underrepresentation as well as women's agency in navigating obstacles to achieve leadership positions.

Intersectionality

Intersectionality refers to the differences between various social categories, including gender, race, class, ethnicity, and sexuality, among others (Harris & Bartlow, 2015; Weldon, 2008). According to Moss et al. (2002), people facing discrimination or oppression encounter multiple forces, and thus, fighting it along one axis is defeatist. According to Crenshaw et al. (1995) as cited in Valentine (2007), race, ethnicity, and gender, among others, should not be treated as separate categories. Instead, these social categories interlock and interact to further discrimination and oppression and cannot be separated (Bell, 2016). Feminists argued that these forms of social stratification need to be studied in relation to each other and must be conceptualised as a "matrix of domination" and "complex inequality."

Minow (1997, p. 38) in (Valentine, 2007) defined intersectionality as "the way in which any particular individual stands at the crossroads of multiple groups." Intersectional analysis examines the multiple forms of discrimination that people encounter in everyday interactions (Valentine, 2007; Werbner, 2013). Central to this concept is what Andersen and Hill Collins (1992, xii) cited in Valentine (2007) termed "interlocking categories of experience," emphasising the interconnection between gender, race, class, and sexuality and their interdependence with other categories.

Phoenix and Pattynama (2006) noted that the intersectionality concept brings to light the multiple positioning that constitutes everyday life and the power relations that are central to it. Carastathis (2014) argues that intersectionality addresses fundamental theoretical and normative concerns within feminist scholarship, thereby acknowledging the differences between women and men. Fernandes (2003, p. 315) contends that intersectionality should not be treated as a binary difference in gender (men or women) or race (black or white), but rather, it should be used to "unpack the tension between articulation and aphasia". Thus, discourses on difference should not just examine gender, race, ethnicity, or class in isolation but also how they interplay to affect people, which is currently not the focus of theories about occupational segregation. Intersectionality has become a key concept in the feminist project of deconstructing the binary oppositions and universalism inherent in modernist philosophy and science (Carastathis, 2014; Phoenix & Pattynama, 2006).

Inspired by postmodernism, intersectionality has been used by feminists to further the postmodern idea of conceptualising multiple and shifting identities (Maclaran & Stevens, 2019). This idea coincides with the perspective of Foucault that "it is no longer an identity that we need to recover…but a difference" (Harrison, 2006, p. 122). It emphasises the importance of focusing on power relations, reflexivity and situated knowledge, which are crucial for understanding the complexities of women's experiences in STEM (Sweet, 2020).

Motivation for Choosing STEM

The concept of motivation is not amenable to a universal definition but can be understood from a process-oriented perspective, psychological drive perspective, need-based dimensions or work related (Ryan & Deci, 2000; Reeve, 2018, Myers & DeWall, 2019; Robbins & Judge, 2019). While Ryan & Deci (2000) speak of motivation as a process that initiates, guides and sustains goal-directed behaviour, Reeves speaks (2018) to the internal processes that give behaviour its energy and direction. American Psychological Association (2018) defines motivation as the drive that gives purpose or direction to behaviour and operates in humans at a conscious or unconscious level. Recent reviews, however, show the multifaceted nature of motivation for girls in STEM to cover self-efficacy, interest (intrinsic), perceived utility (value), belonging, role models, family/teacher support, and stereotype threat which all interact at different levels to influence aspirations, choices and persistence in STEM. The general distinctions between intrinsic and extrinsic motivation will be applied in this paper (Luttenberger et al., 2019; Vansteenskiste et al., 2006; Ryan & Deci. (2000). These broad categories cover *intrinsic* reasons (interest, enjoyment, autonomy) and *extrinsic* reasons (outcomes, rewards); self-determination and STEM self-concept (self-efficacy) (Luttenberger et al. (2019).

Methods and Data Collection

The targeted institutions for data collection in this study were from both academia and industry which are involved in water and sanitation (WASH)-related activities. These included two academic and research institutions (ARIs) and two industrial organisations (IOs) in both governmental and non-governmental space. This deliberate selection aimed to capture diverse perspectives from key stakeholders within the academic, research, governmental and industrial sectors on women's career progression in STEM. Data collection spanned between April and August, 2023 using in-depth interviews of 20 female leaders from middle and higher management levels.

Participants occupied a variety of leadership roles, including heads of departments, senior researchers, project coordinators, unit heads and directors in both academic and industrial STEM institutions. The academic backgrounds of the participants were equally diverse, ranging from engineering and physics to public health and environmental studies, among others. In terms of work experience, participants should have been employed in the STEM sector for periods ranging from 6 to 25 years, with leadership experience spanning 3 to 15 years. Most of the interviewees were married and had children. Most of them were also older than 35 years. The interviewees involved in the study included women in both senior management and mid-level career. The diversity in the targeted institutions and among the female participants present gender-diverse opinions on career progression in STEM. The experiences they shared provided rich information regarding the intersection of organisational culture with societal expectations and agency in determining a career path and highlighted the complexity of a STEM career in Ghana,

and particularly, that of women. For anonymity and protection of participants' privacy, a system of pseudonyms which also serve as identifiers for participants has been gleaned from the intersections of their positions as female leaders (FL) and institutions identified as industry (IO) or academic research institution (ARI). Therefore, FLIO1-1 identifies the first female leader in the first industrial organisation while FLARI2-3 identifies the third female leader in the second academic and research institution. Additionally, some observations with significant differences by age, education or field of study have been appropriately indicated for a deeper appreciation of the context or implication of findings. This combined pseudonym and identifier approach ensures data integrity while providing a systematic way of identifying participants without compromising the ethics of research.

The interviews enabled a thorough exploration of unique individual experiences related to career advancement, including the barriers faced and the motivational factors and strategies that drive women's STEM careers. Key themes discussed included career advancement, barriers like gender bias and work-life balance issues, motivational factors, the importance of mentorship and networking and the role of organisational support in promoting inclusivity.

After collecting the data, the audio recordings were transcribed into text. The transcriptions were thematically coded and analysed manually, which helped identify patterns and themes regarding motivation, barriers and strategies for leadership in STEM. Direct quotes from participants enriched the findings, giving voice to the experiences of women in STEM and highlighting the complexities they navigate in their careers.

Findings and Discussion

Motivation for choosing a STEM career

Participants were found to be both self-motivated and very much motivated externally. FLIO2-4 who is a young engineer exemplified this self-efficacy in response to what got her into STEM. She explained,

> I'm a young lady, I'm self-motivated, and then I'm very focused Well, growing up, I think it is the environment, I had older siblings and family friends who were in the engineering and construction field. So, when I passed my WASSCE, I think I had about three areas of interest, but I finally settled on engineering. All those with civil engineering, were all males. Like the females, I hadn't met a lot of female engineers, so I think that challenge was also part of why I did that. Yeah. I was actually encouraged by a civil engineer (my brother-in-law) that the ladies are few. There was this perception that female engineers can't do the work well or females can't pursue engineering. So, I should be part of those who are breaking that perception. So, I just took the challenge and did the civil engineering to see how I would fare myself. Yeah."

This also highlights the role of family members, especially parents in generating and sustaining their daughters' interest in STEM with others such as external relations, teachers, role models and mentors (Awoniyi & Jokotagba, 2025; Luttenberger et al., 2019). FLIO2-3

> I feared my father, and I honoured him, and he had the final word in my life, so I did all that he said. And one of them was '*go to school*' and 'you dare not fail' and you cannot have 80 whiles someone had 81. So, I believed in his inspiration which led me on. So, I did everything, I studied as much as I could and the studying produced results, so he was quite excited about it. And then in those days they said oh if you are good then you do science if you are not too good then you do something else. So, they thought I was good so I should do science and that is how I did science.

Similarly, FLARI2-3, a scientist recounted,

> It started with my mother calling me and saying my daughter will become a doctor. My grandmother as well. And I just excelled in school. They realised that I was getting high grades in math and science. The teachers would also say you can do it, you can do it. You are doing well.

In older years, the support of husbands, the inspiration of role models and mentors, an inclusive and supporting work environment as well as self-efficacy have served as significant sources of motivation to women in STEM fields.

Challenges of pursuing a STEM career in Ghana

A central issue addressed in this paper is to outline the challenges faced by women in STEM, particularly in the WASH sector, and how they navigate these barriers. Technical expertise is foundational to establishing credibility and respect in STEM fields (Messner, 2017). However, technical competence alone is insufficient for effective leadership. STEM leaders must also possess soft skills such as communication, collaboration, and problem-solving (Karimi & Pina, 2021). In Ghana, STEM leaders often encounter significant challenges stemming from the intersection of their gender and associated social categories in their attempt to carry out their roles effectively. As FLIO2-4 who is also young noted:

> For the relationship with the engineers is cordial because they understand that we're meant to but when we get to the ground, the contractors are okay but the artisans, they can be a bit problematic because sometimes in trying to direct them to do maybe something, they may misconstrue your directive. If a guy is hard, it's like, oh, this engineer, he's hard but when it comes to a lady it's like you are disrespectful. So, I think for the artisans, not everybody is so open when it comes to female engineers telling them what to do, like small girl, who are you to tell me to dig here or not dig here. I think that is their relationship, but we have to manage it.

Women's competence is often scrutinised more rigorously due to pervasive gender biases that question their capabilities in traditionally male-dominated STEM domains (Cheryan et al., 2017). This supports Ridgeway (2011) claim that gender is an institutionalised system of social practices in which societal norms govern the relations between men and women, frequently placing women at a disadvantage in STEM and other male-dominated areas. As Giddens argued, societal structures shape individual agency, and in turn, individuals can challenge or reinforce these structures through their actions (Holt-Jensen, 2009). Women in STEM must navigate this duality by not only excelling technically but also challenging the stereotypes that undermine their expertise. This instance can be understood through Giddens' (1984) structuration theory, which holds that while social structures shape individual agency, people can also change these structures by their behaviour, thereby challenging stereotypes and redefining norms in the STEM discipline.

Limited access to adequate resources – tools, instruments, and funding essential for conducting research and driving innovation in STEM is another challenge. Here, the intersection of gender and structural issues of funding, equipment and care roles thus places a greater challenge on women than men in STEM. It has been established that women in STEM often work in under-resourced environments that hinder their productivity and career progress. FLARI2-3 who is aspiring to a higher position shared her experience,

> I need to have ten publications at the moment for me to move from a research scientist to a senior research scientist. That means that it takes me five years to move up the rank. That means every year I need to publish two papers. And with my kind of research, I get to use equipment that are not readily available in Ghana. And so, I'm restricted or limited in that if I don't have collaborators outside, I can't get anything done. So, it's quite tough.

The challenges are even more profound for women when they visit remote locations to collect samples for their research. Participants indicated how more challenging it is for female scientists to navigate the field terrain without proper equipment such as boots, vests and gloves among others. Additionally, they observed that unlike their male counterparts, female scientists are more challenged with their family care arrangement when it comes to travelling to the field for longer days as part of their research. Therefore, their care roles intersect with structural institutional challenges which negatively affect women in STEM.

The lack of relevant equipment in the laboratory reflects a broader social prejudice that is more likely to direct resources into overwhelmingly male areas of study or institutions at the expense of others, resulting in underfunding or inadequate equipment. This demonstrates the idea of gender as a social relationship, where patriarchal systems support systematic disparities in resource distribution and give preference to male-dominated areas (Dixon & Jones III, 2006). Therefore, transforming such disparities

requires systemic change to confront patriarchal expectations and ensure equitable resource distribution so that all researchers, irrespective of specialisation or gender, can make equal contributions to areas of study.

Another challenge confronting career development in STEM fields is social expectations that often manifest as doubts about women's technical abilities and leadership potential. FLIO1-6 who currently is a head of a unit, for instance, noted that as she pursued information as part of her work, she was considered rude and bothersome. According to her, people always say, "You are asking too many questions, and it's like it's a bother to them." Such perceptions are rooted in social expectations that women should remain passive, which significantly impacts their opportunities for career advancement. Already, from an early age, girls are socialised into caregiving roles over curiosity and problem-solving (Cerbara et al., 2022). These stereotypes persist into adulthood, influencing career trajectories and workplace dynamics.

Socio-culturally embedded views about gender-appropriate roles often put pressure on women and can limit their aspirations and professional choices. The idea that gender is a social construction, where beliefs and norms create and maintain inequalities between men and women, influencing their professional paths, is seen in these societal expectations (Dixon & Jones III, 2006). Societal expectations regarding caregiving create additional pressure, making it challenging for women to pursue demanding STEM careers. FLARI2-1 who is more than 50 years, and a research scientist noted, "my uncle wanted me to do mechanical engineering. But when I discussed it with my chemistry teacher, he said, You are a woman; why do you want to do mechanical engineering? You should do something different." According to her, this remark by her chemistry teacher demoralised her and almost derailed her aspiration to pursue STEM education. For some women in the STEM field, these negative social views intersect with care roles like childbirth and adversely impact their work. As FLIO2-2 noted,

> After giving birth, I went through the three-month maternity leave. I resumed work in the fourth month and was still moving around with my baby. I didn't have a babysitter, and this was difficult. However, my boss allowed me flexibility in my work hours. But I could not focus on my work.

The current labour practice in Ghana creates challenges for new mothers who resume work three months after childbirth and struggle with combining work and family life. In the case above, although the supervisor allowed FLIO2-2 to work flexibly; she lacked focus and this could have affected her ability to explore new opportunities for career development without the necessary support. With balancing their respective homes and their work, almost all the women especially the married with children confirmed how challenging it was. FLARI1-5 who is a scientist in senior management position and joined her institution with a young family many years ago, shared her experience,

> I was the youngest faculty, and I was there with my lecturers. I had young children then. My focus was teaching. So, it was just teaching, teaching. And with family, when there was an opportunity for me to even go outside to do any of the other training, it was difficult. So, I just taught and did research as my time could allow, or resources could allow."

FLIO1-2 who is an older senior manager with children in her younger years simply admits,

> Balancing the two can be challenging, it can be difficult, but we prioritise to determine the most important activities, for work and for family. When I was starting, by 5pm I would close and continue work at home. Even now you close, and sometimes you have to send work home.

FLIO2-4, who is a young nursing mother and a professional, also confirms as follows:

> I recently got married, so, I'm still quite new in that aspect. But it's not easy. So, when I wasn'tmarried it was easier but when I got married and childbirth came in, it is a bit difficult, but I'm managing.

Another significant barrier, particularly for women, is the lack of female role models and mentors in STEM careers which translated into limited and delayed mentorship opportunities. Responding to the issue, FLARI2-2 who is a young scientist alluded to this: "I haven't really identified anybody in my field. For me, I would have approached that person and said, Madam, I've seen that you're a senior in this place and I want you to mentor me because once you get the mentorship, you'll skip some mistakes and launch out." Similarly, FLARI1-2 with more than 30 years in her institution explains: "The department had only one female, but she was not the head. I became a lecturer and started team teaching with two male senior colleagues and it was one of them who mentored me."

These experiences underscore the lack of female mentors and role models in the STEM fields as compared to their male counterparts who were also found in more leadership positions. The absence of accessible mentorship can hinder women's professional growth, leaving them without the guidance and support necessary to navigate their careers effectively (Mitchell, 2018).

It was also found that many organisations lacked supportive structures that promote inclusivity and diversity. Participants expressed that existing policies often fail to address the unique challenges faced by women in the STEM field. Instances of gender bias in recruitment processes were also noted. For example, FLIO2-1 narrates,

> When I joined a public organisation I was first recruited into, they had the project unit, and they needed an engineer for which I am qualified. However, the project coordinator said, 'I don't want a lady'. At the time, they were recruiting 14 engineers, so they said they were going to put one engineer in the project office. He was very emphatic, saying, 'I don't want a lady.' My director

> at the time said, 'Well, I'm going to give you an intelligent lady; you'll like her. The man said, 'No, I don't like a lady'. So, I ended up in the main office instead of the project office.

Thus, for women, their competence and expertise are not enough, as they must also deal with patriarchal and misogynistic attitudes from colleagues. While the challenges facing the STEM field may not necessarily be limited to women, they are disproportionately affected by these issues. This is because women face the intersection of personal, organisational and societal barriers that work in ways to make their career in STEM remarkably more challenging compared to their male counterparts. This challenge can be understood through the lens of intersectionality, which explains how interconnected social categories, such as gender and institutional bias, combine to create unique forms of discrimination and oppression (Crenshaw et al., 1995; Valentine, 2007).

FLIO2-4, who is a young professional alluded to loss of jobs for women who get pregnant and do not have security on the job but are on contracts or part time. She explains, "As a female and as a mother, it could be difficult to come across other employment opportunities if you are not in full time? Because most employers would want to have a male who will not have a lot of responsibility like not a lot of kids or using kids as an excuse. Like women, for instance, once we have babies we have a lot of excuses."

Navigating challenges and advancing women's leadership in STEM

Impact of mentorship and networking opportunities

According to Giddens (1984), social norms guide people's actions; however, they can also resist and reform these norms. This theoretical ideology helps to understand how Ghanaian women in STEM fields utilise social/family support, leadership support and mentorship networks to overcome systemic barriers. Leveraging family support, mentorship, networking opportunities, personal resilience and other forms of coping mechanisms, women are able to navigate and advance in STEM careers. The intersection of individual identities, societal norms and institutional structures shapes these approaches. It was established that successful Ghanaian women in STEM fields rely on professionals to gain valuable insights into overcoming barriers and advancing their careers and this was seen in a number of experiences shared by many of the participants who appreciated the mentoring role of their leaders. Mentorship networks, for instance, play a crucial role in providing guidance, support, and access to resources (Ginther & Kahn, 2014).

Successful women in STEM fields deployed diverse resources and strategies to navigate careers into leadership. At the individual level, it was established that parental influence plays a pivotal role in shaping children's career aspirations. Their attitudes towards different professions can significantly influence their children's interests and career choices (Lloyd et al., 2018). FLIO2-3 who had a doctorate degree echoes the

effect of parental influence on the choice of her career as follows: "I feared my father, and I honoured him, and he had the final word in my life, so I did all that he said, including pursuing STEM." Similarly, FLARI2-3 recounted:

> Everybody thought I would go into medicine…. My aunt, who headed a health organisation, was going to push me into medicine. But she died before. So, I didn't get to become a medical doctor, but I became a doctor of research.

These narratives illustrate the impact of parental and family expectations on career choices. Parental support and encouragement in breaking down gender stereotypes and promoting gender diversity in STEM are, therefore, essential (Nawabi et al. 2019; UNESCO, 2017).

For many participants, technical expertise is fundamental to their progress in STEM careers, characterised by the ability to inspire, innovate, and collaborate effectively. As FLARI1-4 noted,

> a successful STEM woman, I'll say, is one who can combine social and professional life and be able to apply STEM field to solve problems in society and not theoretically. So, you can do all the research you want, but how does that impact the young girl living on the streets and the woman in the village? So, we should relate a lot more.

Thus, technical competence lays the foundation for credibility and respect, which is essential for effective leadership (Messner, 2017). However, technical expertise alone is insufficient. According to FLOI1-2,

> My ability to manage my emotions effectively, read and understand the emotions of others, and respond appropriately without getting angry, even when people get on my nerves. Sometimes, they will behave as if you are not even there. But you should be able to read and understand and manage yourself well and also know how to manage people. As a woman, if you do that, people tend to like you.

FLARI1-2 who is a scientist in senior management position also adds:

> My area is male-dominated. Because I know how our males are, you have to be respectful and humble, I have been able to do that and publish with them. They encourage me. For my African men, maybe men in general, you don't want to... even if you know, don't be too... they call it forward. Don't be too forward but you know, demonstrate excellence and then be different. That's how I've done it.

In effect, STEM leaders must also possess a range of soft skills, such as communication, collaboration, and problem-solving abilities (Karimi & Pina, 2021). These skills enable leaders to effectively convey complex technical concepts, collaborate with diverse teams, and devise creative solutions to challenging problems. STEM leaders also need to be

visionary and capable of anticipating future trends and challenges in their field. The study showed that foresight in identifying opportunities for innovation and pushing the boundaries of what is currently possible, as McCauley (2017) posits, is key to navigating the challenges in the STEM field.

STEM leaders also need to be visionary and capable of anticipating future trends and challenges in their field. They must have the foresight to identify opportunities for innovation and the courage to push the boundaries of what is currently possible, as McCauley (2017) posits. This requires a continuous learning mindset and the adaptability to stay abreast with rapid advancements in technology and science. FLIO2-1 recounts some personal characteristics and strategic activities that saw her move from a secure job to a Consultant Engineer status to include perseverance, her vision to impact society environmentally, independent mindedness, international exposure through education and contacts with high-level diplomats both in the public and non-governmental space, proposal writing and project coordination, negotiation skills and capacity building programmes among others.

Ridgeway (2011) argues that gender is an institutionalised social practice shaping the expectations and norms of society, thereby determining career pathways. This notion highlights the importance of networks and mentorship in combating existing stereotypes and facilitating the equitable advancement of women's careers in STEM. Mentorship and networking opportunities are critical in shaping the trajectory of women's careers in STEM fields. The presence of mentors and a strong network influence women's professional growth, opening doors to opportunities, providing guidance and offering valuable insights based on their experiences (Mitchell, 2018). Mentorship has been found to have a profound impact on the career progression of women in STEM. A mentor can provide advice, feedback, and support, helping mentees to navigate the challenges of the STEM landscape. According to FLARI1-4,

> It was after my first degree that I met a senior academic in mathematics, and he guided me through. He can send me to do activities for him, even abroad. So, I worked with him. I would say he was my mentor.

FLIO2-4 also indicated,

> Yeah, there are role models I look up to. In my field, I have a few because the women are not many, but I have women that I look up to in my field and beyond my field too, I have seen some women that I want to also work towards. You know, internally, we have institutions, we have the WINE, women in engineering, and they normally have mentors who we look up to.

Mentors share knowledge and experiences, helping their mentees avoid potential pitfalls and capitalise on opportunities. Mentors also provide emotional support, helping women to build confidence and resilience in male-dominated environments and helping them compete well in male-dominated settings, as indicated by FLIO2-1, an engineer:

"It is Prof. Grace herself and one of the male mentors I admired who, actually pushed me to do further studies and to remain in the sanitation sector". Moreover, mentors can help women in STEM develop essential skills such as leadership, communication and negotiation, which are crucial for career advancement (Woodard et al., 2022). They also provide career guidance, helping their mentees to make informed decisions about their professional growth.

Networking opportunities also play a significant role in the career progression of women in STEM. Social networks provide access to resources, information and opportunities that may not be readily available otherwise (Wellman, 2018). . The role of social networks in navigating STEM careers is invaluable, particularly for Ghanaian women. Networks offer avenues for individuals to connect with their peers, potential mentors and influential figures in their field, thereby creating opportunities for collaboration, knowledge exchange and career advancement, as noted by FLARI1-3 "I joined my institution in the early 2000. I was recruited specifically for a purpose to start a programme at my department. A senior colleague had encouraged me to apply."

For many participants, networks are not just resources they deploy to enter STEM careers but are also essential for career advancement. This is exemplified by FLIO1-6, a senior management officer in who noted, "I was recommended by one of my colleagues, whose father was the HR manager in the company." It is argued that networks provide a sense of community, helping women in STEM to overcome feelings of isolation and exclusion. According to Gultekin et al. (2024) networks offer platforms for women to share their experiences, challenges and successes, fostering a sense of solidarity and mutual support essential for Ghanaian women's ability to navigate the challenges in the STEM career.

However, while the benefits of mentorship and networking are clear, it is crucial to note that access to these opportunities is often uneven. Barriers such as gender bias, lack of representation and the 'old boys' network can limit women's access to mentorship and networking opportunities in STEM (O'Connell & McKinnon, 2021). Therefore, efforts are needed to ensure that these opportunities are accessible and inclusive, enabling all women in STEM to benefit from the support, guidance and connections they offer.

Organisational support and an inclusive work environment

Theoretical insights from Giddens' structuration theory (1984) underscore the importance of organisational culture in shaping individual agency. The duality of structure posited by Giddens suggests that while social structures influence individual behaviour, individuals can also reshape these structures through their actions. Ghanaian women in STEM who challenge stereotypes and advocate for policy changes contribute to transforming workplace norms, paving the way for greater inclusivity. The creation of supportive organisational structures and inclusive work environments is critical to the success and retention of women in STEM fields. As Yildiz et al. (2023) assert,

organisations play a significant role in shaping the professional experiences of their employees. They can either foster a culture that supports, reintegrates and encourages diversity or perpetuates a culture that inhibits the progress of women in STEM.

Supportive organisational structures and inclusive work environments are critical for retaining women in STEM fields. Organisations that prioritise diversity and inclusivity significantly enhance women's experiences by addressing unconscious biases, providing resources for professional development, establishing mentorship and sponsorship programmes and implementing policies that support work-life balance (Amon, 2017). Inclusive workplaces also challenge traditional gender norms by ensuring equitable treatment of all employees. Such support can help women navigate the challenges associated with STEM fields, improve their skills and advance in their careers (Amon, 2017). For example, policies such as flexible working hours for new mothers or on-site childcare facilities can help women balance professional and personal responsibilities. However, responses from participants indicated that such measures are often inconsistent or underdeveloped in Ghanaian institutions. Participants argued that while maternity leave policies allowed for early closing from work, broader structural support such as workplace nurseries are lacking.

FLIO2-2 highlighted a particular example of the importance of supportive management and organisational culture as follows:

> My boss has been very supportive. He gives me the opportunity to learn. And then, since I've been working with him, even as a field officer, he doesn't dictate to me or give strict directives. So, he allows me to make decisions. Even if the decisions are bad, he allows me to learn from my weaknesses. Then he will tell me next time, do it this way. So, he has been coaching me well.

Inclusive work environments, value and respect for diversity cultivate a culture where everyone, regardless of gender, feels welcomed, valued and included (Samašonok et al., 2023). In such environments, women are more likely to feel a sense of belonging and less likely to experience feelings of isolation or exclusion, which are common in male-dominated fields, such as STEM. Inclusivity in the workplace also involves addressing unconscious biases and stereotypes that can hinder the progress of women in STEM. This requires ongoing education and training as well as the willingness to challenge and change deeply ingrained beliefs and behaviours. Unfortunately, in the Ghanaian context, this is lacking. Responses gathered indicated that there were no reintegration measures in place; instead, the measure put in place was that women have been supported with a policy that gives them the privilege of reporting a little late and closing early from work. According to FLARI2-1,

> Here in this organisation, what we have is that when you resume from your maternity leave, you close two hours earlier than the normal time, and there is flexibility here. For instance, we advocated for a nursery so that we could bring in our house help. It has not been done yet, but we must do some gender mainstreaming and whatever it is.

Organisations can promote inclusivity by ensuring that women are adequately represented at all levels, including leadership positions. A supportive organisational environment also entails continuously monitoring and evaluating the effectiveness of implemented strategies and making necessary adjustments to ensure their success.

Educational interventions and personal goals

Educational interventions play a pivotal role in shaping individuals' career paths, particularly in STEM fields. These interventions, which can range from curriculum design and teacher or instructor encouragement to extracurricular programmes, have the potential to spark interest in STEM, build confidence, and develop the necessary skills. A well-structured educational intervention can help counter societal and cultural stereotypes that STEM fields are predominantly male-oriented (Jones, 2020). It can provide students with exposure to varied aspects of STEM, demonstrating the applicability and relevance of these fields in everyday life. Previously, in some societal settings, exceptionally 'brilliant' students were encouraged or allowed to pursue STEM-related careers. For instance, FLIO2-1 who is an engineer indicated:

> So, I kind of liked things about the environment but I really didn't know what I wanted to do. I was a very intelligent student in the class. I skipped Class 6 and I had to compete with all these huge guys who saw this tiny little girl as a threat. So automatically, when I had to choose a course at high school, the teachers pushed me to choose science. I used to dream about all those people with their legs hanging out and my father fixing their teeth and all those kinds of things, so I knew that medicine was not a place for me, and I did not want to do anything in university that involved biology.

This exposure can serve to broaden students' understanding of STEM, helping to dispel misconceptions and stimulate interest. Moreover, educational interventions can provide hands-on experiences, allowing students to apply theoretical knowledge in a practical context. This experiential learning can serve to enhance understanding, build problem-solving skills, and foster a sense of achievement and confidence. Education also plays a critical role in goal-setting, as personal goals are often shaped by one's educational experiences and perceptions of abilities (Bandura, 1993; Burns et al., 2018). Such perceptions in the Ghanaian context are often informed by teachers. FLARI1-4 observed:

> So, growing up, I was curious like every child is. But I think I was asking a lot of questions about nature.....sometimes, I get answers from home. My teachers would tell me, hey, when you go to secondary school, you have to take science. You have to do Physics… …so it was like every time hitting on my mind, you have to do science. So, I did science in the secondary school.

Therefore, positive experiences in STEM education can lead to the setting of career goals within these fields. As Dixon and Jones III (2006) noted, gender is a construct, and these societal norms and belief systems reinforce inequalities between men and women. Thus, for women pursuing STEM careers, the theory effectively supports and backs educational interventions that actively counter stereotypes and promote gender-inclusive classroom environments.

In the context of gender disparity in STEM, educational interventions that foster an inclusive and supportive learning environment are crucial. Such interventions can help address problems such as stereotype threat, where negative stereotypes about a group's abilities can impact individual performance. Recounting such an instance, FLARI1-6 indicated;

> they were doing a collaborative project in my department. It was part of the project to take master students and technicians. That year, they were taking two – one male, one female. I happened to be the only female in the class so was part of the people who were selected. So, we were supposed to finish, come back, and then enrol for PhD studies and this was how my educational journey started.

By actively challenging these stereotypes and fostering a culture of inclusivity and respect, educational institutions can help to build confidence and ambition in all students, regardless of gender. Careful educational interventions designed to ensure effective and inclusive training are essential for orienting women in STEM careers. Institutions must also prioritise training educators to recognise and address their biases, ensuring that all students receive equitable support (Carter et al., 2020).

Conclusion

This paper highlights the numerous challenges and barriers women face in Ghana as they pursue careers in STEM. The research, employing a qualitative approach, reveals that despite considerable educational advancements in recent decades and efforts to increase women's participation in STEM, gender disparities persist. Both intrinsic and extrinsic motivation accounted for the interest and stay in STEM fields for the participants with self-efficacy, parental influence, female role models and mentors playing significant roles. Key challenges include gender bias, the absence of female role models, limited mentoring opportunities, and deep-seated social expectations, which hinder women's advancement and their presence in leadership positions within STEM disciplines. The findings highlight the pressing need for supportive organisational structures and inclusive work environments to retain and promote women effectively in STEM. Organisations must proactively implement policies that encourage mentorship, professional development and work-life balance while cultivating a culture of diversity and inclusivity. Mentorship is especially critical - not only for providing guidance and support but also for empowering individuals to build confidence and navigate challenges within male-dominated fields.

Moreover, the influence of parental and societal expectations cannot be overlooked. Fostering positive attitudes toward STEM from an early age is crucial, alongside educational initiatives that challenge and dismantle stereotypes. Incorporating female role models into school curricula and offering extracurricular STEM activities can significantly boost young girls' interest, self-confidence and aspirations not only to pursue careers in these fields but also to navigate their way to leadership positions successfully.

Female leaders in Ghana are not only overcoming these barriers but are also paving the way for future generations to come. Addressing the systemic issues that perpetuate gender inequality requires a coordinated effort involving educational institutions, organisations, policymakers and society. Such collaboration will prove indispensable in breaking down the structures that sustain gender inequities in STEM. By removing the hurdles facing women's advancement, implementing open practices and creating a fair STEM environment, Ghana can unlock the full potential of its talent pool of women, contributing to a more balanced society while advancing national development. Leaders in STEM exemplify the resilience and determination that can flourish when barriers are dismantled, and opportunities are equitably shared.

Acknowledgement

This work is part of the TranSforming InSTitutions to Advance women leadeRS in Science Technology Engineering and Mathematics (SISTARS) project funded (Grant # 109795-001) by the International Development Research Centre of Canada (IDRC).

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Austin Dziwornu Ablo https://orcid.org/0000-0002-8240-4599
Benedicta Yayra Fosu Mensah https://orcid.org/000-0003-3569-472X
Cynthia Addoquaye Tagoe https://orcid.org/0000-0002-7287-7843
Charlotte Wrigley-Asante https://orcid.org/0000-0002-7538-7452

References

Ackah, C., Ahiadeke, C., Fenny, A.P. (2009). Determinants of Female Labour Force Participation in Ghana, GDN Working Paper, No. 14, Washington DC.

Amon, M. J. (2017). Looking through the glass ceiling: A qualitative study of STEM women's career narratives. *Frontiers in Psychology*, *8*, 236. https://doi.org/10.3389/fpsyg.2017.00236

Awoniyi, F. C. and Jokotagba, S. T. (2025). Parental Influence, Career Counselling, and Role Models in Girls' STEM Career Choices: Evidence from Three Public Universities in Ghana. *European Jounal of STEM Education*, 10(1), 05. https://doi.org/10.20897/ejsteme/16432

Baah-Boateng, W., Nketiah-Amponsah, E. & Frempong, R. (2013): *The effect of fertility and education on female labour force participation in Ghana. Ghanaian Journal of Economics, 1(1)*: pp. 1-19. https://hdl.handle.net/10520/EJC169506

Baker, D. R., & Baker, D. R. (2016). Equity issues in science education. In *Understanding girls: Quantitative and qualitative research*, (pp. 127-160). Lieden: Brill.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28(2), 117-148. https://doi.org/10.1207/s15326985ep2802_3

Bell, L. A. (2016). Theoretical foundations for social justice education. In *Teaching for diversity and social justice* (pp. 3-26). Oxfordshire: Routledge.

Boserup, E., Kanji, N., Tan, S. F., & Toulmin, C. (2013). *Woman's role in economic development*. London: Routledge.

Burns, E. C., Martin, A. J., & Collie, R. J. (2018). Adaptability, personal best (PB) goals setting, and gains in students' academic outcomes: A longitudinal examination from a social cognitive perspective. *Contemporary Educational Psychology, 53*, 57-72. https://doi.org/10.1016/j.cedpsych.2018.02.001

Carastathis, A. (2014). The concept of intersectionality in feminist theory. *Philosophy Compass, 9*(5), 304-314. https://doi.org/10.1111/phc3.12129

Carter, E. R., Onyeador, I. N., & Lewis Jr, N. A. (2020). Developing & delivering effective anti-bias training: Challenges & recommendations. *Behavioral Science & Policy, 6*(1), 57-70. https://doi.org/10.1177/237946152000600106

Ceci, S. J., Ginther, D. K., Kahn, S., & Williams, W. M. (2014). Women in academic science: A changing landscape. *Psychological Science in the Public Interest, 15*(3), 75-141. https://doi.org/10.1177/1529100614541236

Cerbara, L., Ciancimino, G., & Tintori, A. (2022). Are we still a sexist society? Primary socialisation and adherence to gender roles in childhood. *International Journal of Environmental Research and Public Health, 19*(6), 3408. https://doi.org/10.3390/ijerph19063408

Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). Why are some STEM fields more gender balanced than others? *Psychological Bulletin, 143*(1), 1. https://psycnet.apa.org/buy/2016-48466-001

Conrad, M. O., Abdallah, A. R., & Ross, L. (2021). Why is Retaining Women in STEM Careers so Challenging? A Closer Look at Women's Insights and Experiences in STEM Fields. 2021 ASEE Virtual Annual Conference. 10.18260/1-2--38060

Crenshaw, K., Gotanda, N., Peller, G., & Thomas, K. (1995). *Critical race theory: The key writings that formed the movement*. New York: The New Press.

Dasgupta, N., & Stout, J. G. (2014). Girls and women in science, technology, engineering, and mathematics: STEMing the tide and broadening participation in STEM careers. *Policy Insights from the Behavioral and Brain Sciences, 1*(1), 21-29. https://doi.org/10.1177/2372732214549471

Dixon, D. P., & Jones III, J. P. (2006). Feminist geographies of difference, relation, and construction In *Approaches to Human Geography*, (pp. 42-56) London: Sage.

Duflo, E. (2012). Women empowerment and economic development. *Journal of Economic Literature, 50*(4), 1051-1079. 10.1257/jel.50.4.1051

Fernandes, F. (2003). A response to Erica Burman. European Journal of Psychotherapy & Counselling, 6(4), 309-316. https://doi.org/10.1080/1364253042000281351

Ginther, D. K., & Kahn, S. (2014). Women in economics: Moving up or falling off the academic career ladder? *Journal of Economic Perspectives, 28(4), 163-194.* 10.1257/0895330042162386

Gultekin, D., Yildirim, N., & Ozturk-Kilic, S. (2024). Empowering refugee and local women through social cooperatives: an unfinished success story in Southern Türkiye. *Social Enterprise Journal*. 20(5) 857-887(31) https://doi.org/10.1108/SEJ-03-2024-0035

Harris, A., & Bartlow, S. (2015). Intersectionality: Race, gender, sexuality, and class. *Handbook of the sociology of sexualities*, (pp. 261-271). Cham: Springer International Publishing.

Harrison, P. (2006). Poststructuralist theories. In *Approaches to Human Geography*, (pp.122-135). London: Sage.

Hill, C., Corbett, C., & St Rose, A. (2010). *Why so few? Women in science, technology, engineering, and mathematics*. Washintong DC: AAUW.

Holt-Jensen, A. (1980). Geography, its history and concepts: A student's guide. London: Sage

Holt-Jensen, A. (2009). Geography, History and Concepts: A Student's Guide. London: Sage

Jones, T. E. (2020). *Sustainability and Success in STEM: An Ethnography of Females and Their Experiences in the Field*. Arizona: Prescott College.

Kahn, S., & Ginther, D. (2017). *Women and STEM*. (No. w23525). National Bureau of Economic Research.

Karimi, H., & Pina, A. (2021). Strategically addressing the soft skills gap among STEM undergraduates. *Journal of Research in STEM Education, 7*(1), 21-46. https://doi.org/10.51355/jstem.2021.99

King, T. L., Scovelle, A. J., Meehl, A., Milner, A. J., & Priest, N. (2021). Gender stereotypes and biases in early childhood: A systematic review. *Australasian Journal of Early Childhood*, *46*(2), 112-125. https://doi.org/10.1177/1836939121999849

Klasen, S., Le, T. T. N., Pieters, J., & Santos Silva, M. (2020). What Drives Female Labour Force Participation? Comparable Micro-level Evidence from Eight Developing and Emerging Economies. *The Journal of Development Studies, 57*(3), 417–442. https://doi.org/10.1080/00220388.2020.1790533

Lloyd, A., Gore, J., Holmes, K., Smith, M., & Fray, L. (2018). Parental influences on those seeking a career in STEM: The primacy of gender. *International Journal of Gender, Science and Technology*, *10*(2), 308-328. https://genderandset.open.ac.uk/index.php/genderandset/article/view/510

Luttenberger, S., Paechter, M., & Ertl, B. (2019). Self-concept and support experienced in school as key variables for the motivation of women enrolled in STEM subjects with a low and moderate proportion of females. *Frontiers in Psychology, 10*, Article 1242. https://doi.org/10.3389/fpsyg.2019.01242.

Maclaran, P., & Stevens, L. (2019). Thinking through feminist theorising: poststructuralist feminism, ecofeminism and intersectionality. In *Handbook of research on gender and marketing* (pp. 229-251). Cheltenham: Edward Elgar Publishing.

McCauley, P. (2017). *Essentials of engineering leadership and innovation*. Florida: CRC Press.

McDowell, L. (2011). *Capital culture: Gender at work in the city*. New Jersey: John Wiley & Sons.

Messner, G. K. (2017). *Determining the Critical Leadership Attributes and Competencies in Science, Technology, Engineering, and Mathematics Educated Army Leaders that Produce Higher Quality Army Leaders* PhD Thesis [Northcentral University].

Minow, M. (1997). Between Vengeance and Forgiveness: Feminist Responses to Violent Injustice. *New Eng. L. Rev.*, *32*, 967.

Mitchell, A. L. (2018). *Woman-to-woman mentorship: exploring the components of effective mentoring relationships to promote and increase women's representation in top leadership roles.* PhD Thesis [University of La Verne].

Moss, P., Falconer Al-Hindi, K., & Kawabata, H. (2002). *Feminist geography in practice: Research and methods*. Oxford: Wiley-Blackwell.

Myers, D. G., & DeWall, C. N. (2019). *Psychology* (12th Ed.). New York: Worth Publishers.

Nawabi, S., Javed, M. Q., Shujaullaand, S., & Ulfat, H. (2019). *Parental influence on career choice of their children: Literature review. International Journal of Advanced Research, 7*(3), 221-227. https://doi.org/10.21474/IJAR01/8625

O'Connell, C., & McKinnon, M. (2021). Perceptions of barriers to career progression for academic women in STEM. *Societies, 11*(2), 27. https://doi.org/10.3390/soc11020027

Oyelana, O. A., Oyedeji, O. A., & Igbinedion, V. I. (2018). Women in science, technology, engineering and mathematics (STEM) in Sub-Saharan Africa: A synthesis of the literature. *Journal of Education and Practice, 9(6), 89-98.*

Padavic, I., & Reskin, B. F. (2002). *Women and men at work*. Newbury: Pine Forge Press.

Phoenix, A., & Pattynama, P. (2006). Intersectionality. *European Journal of Women's Studies, 13(3),* 187-192. https://doi.org/10.1177/1350506806065751

Reeve, J. (2018). *Understanding motivation and emotion* (7th ed.). Hoboken: Wiley.

Ridgeway, C. L. (2011). *Framed by gender: How gender inequality persists in the modern world*. Oxford: University Press.

Risman, B. (2011). Gender as a social structure: Theory wrestling with activism. *Gender and Society, 18*(4), 429-450.

Robbins, S. P., & Judge, T. A. (2019). *Organizational behavior* (18th ed.). London: Pearson.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., & Šimkienė, A. (2023). Creating an inclusive and diverse workplace environment: current realities and trends for improvement. *Entrepreneurship and Sustainability Issues, 10*(4), 184. https://doi.org/10.9770/jesi.2023.10.4(12).

Starr, C. R., & Simpkins, S. D. (2021). High school students' math and science gender stereotypes: relations with their STEM outcomes and socializers' stereotypes.

Social Psychology of Education, *24*(1), 273-298. https://doi.org/10.1007/s11218-021-09611-4

Sweet, P. L. (2020). Who knows? Reflexivity in feminist standpoint theory and Bourdieu. *Gender & Society*, *34*(6), 922-950. https://doi.org/10.1177/0891243220966600

UNESCO. (2015). UNESCO Science Report: Towards 2030. Paris: UNESCO Publishing. A

UNESCO. (2017). *Cracking the code: Girls' and women's education in STEM. Paris: UNESCO*

UNICEF; UN Women; & Plan International. (2025). *Girl Goals: What has changed for girls? Adolescent girls' rights over 30 years*. New York, NY: UNICEF / UN Women / Plan International. Retrieved from https://www.unwomen.org/en/digital-library/publications/2025/03/adolescent- girls-rights-over-30-years UN Women on September 18, 2025

Valentine, G. (2007). Theorizing and researching intersectionality: A challenge for feminist geography. The Professional Geographer, 59(1), 10-21. https://doi.org/10.1111/j.1467-9272.2007.00587.x

Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal contents in self- determination theory: Another look at the quality of academic motivation. *Educational Psychologist, 41*(1), 19–31. https://doi.org/10.1207/s15326985ep4101_4

Wang, M. T., & Degol, J. (2013). Motivational pathways to STEM career choices: Using expectancy–value perspective to understand individual and gender differences in STEM fields. *Developmental Review, 33*(4), 304–340. https://doi.org/10.1016/j.dr.2013.08.001

Weldon, S. L. (2008). Intersectionality. *Politics, gender, and concepts: Theory and methodology*, 193-218.

Wellman, B. (2018). The network community: An introduction. In *Networks in the global village* (pp. 1-47). London: Routledge.

Werbner, P. (2013). Everyday multiculturalism: Theorising the difference between 'intersectionality'and 'multiple identities'. *Ethnicities*, *13*(4), 401-419. https://doi.org/10.1177/1468796813483728

Woodard, J. l., Thum, J. A., Peeters, S., Harary, M., & Liau, L. M. (2022). Being a woman in a male-dominated field. In *Surviving Neurosurgery: Vignettes of Resilience* (pp. 449-458). Berlin: Springer.

World Bank. (2012). *World development report 2012: Gender equality and development*. Washington, D.C.: World Bank.

Wrigley-Asante, C., Ackah, C. G., & Frimpong, L. K. (2022). Career aspirations and influencing factors among male and female students studying Science Technology Engineering and Mathematics (STEM) subjects in Ghana. *Ghana Journal of Geography*, *14*(1).

Yildiz, D., Bozbura, F. T., Tatoglu, E., & Zaim, S. (2023). How do organizational career management activities influence employees' career outcomes? The mediating role of career capital. *International Journal of Organizational Analysis*. *32*(9), 1805-1832. https://doi.org/10.1108/IJOA-06-2023-3817