Priscilla Nyadoi ed.

CAREER GROWTH FOR FEMALES IN SCIENCES, THE CHALLENGES, OPPORTUNITIES AND EXPERIENCES

Gender Studies

Collection Editors
JAN ETIENNE
&
REHAM ELMORALLY

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Abstract

This publication profiles persisting challenges and opportunities underlying career growth for females in sciences based on perspectives from researches, practice and lived experiences. The lived experiences have been drawn from managers, academic staff and students of academic institutions including primary schools, secondary schools and universities and, females in Sciences. Analysis made of all the submissions show and is demonstrated in this publication that, there are recurrent barriers and opportunities perceived to affect females in science academic and career progression. This publication makes no attempt to document the same for males. Nevertheless, researchers, policymakers and the academia world over will find this book useful for insight and guiding decisions regarding development and implementation of strategies towards enhancement of academic and career growth for females in sciences.

Key words

High heels, Leakage, Marriage, Mentorship, Galaxies, Nobel prizes, Gender equity, STEM, Gender bias, Resilience.

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Part I
Learning from the past to the present: Experiences, challenges and opportunities

Introduction

In Part I of this book, experiences, lessons and knowledge on the challenges, opportunities and experiences of females in science in academic and career growth are presented as profiled by leaders who have been involved in training or managing the career progression of females in sciences in one way or another. The leaders are from academic and professional institutions and include higher institution of learning managers, lecturers and teachers,

who have been involved in training and employing females in the sciences. Some of the perspectives are given based on the lived experiences of these leaders, some of them being female in the sciences themselves or being deeply involved in the career paths of females in the sciences at some point in their work.

By the end of reading the chapters in Part I of this book, readers will be able to:

1. Understand the critical role that trainers and higher education institutions play in either perpetuating or solving the gender gap in science.
2. Identify the main barriers to women's participation in science from an educator's perspective.
3. Describe the key strategies that higher educational institutions (universities, colleges) and lower educational institutions (primary schools) can implement to create a more supportive and equitable environment.
4. Recognize the importance of creating visible role models within academic institutions to inspire future generations.

1
Reflecting on experiences and lessons learned from a university engaged in training and mentoring women in sciences for career growth advancement

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Reflecting on issues affecting and opportunities underlying career growth for females, the vice chancellor of Uganda Martyrs

University here, outlines the historical struggles, current opportunities, and persistent challenges for women in scientific fields and, institutional efforts that have been to foster an inclusive environment promoting equality.

Historically, the global scientific community was predominantly patriarchal, with the significant contributions of many women scientists being overlooked or credited to their male colleagues (Galos and Coppock, 2023; WHO, 2019; UN Women, 2023; World Economic Forum, 2023). Notable examples include Rosalind Franklin, whose work was fundamental to understanding the structure of DNA, and Lise Meitner, a key figure in the discovery of nuclear fission.

Pioneers like Marie Curie, the first woman to receive a Nobel Prize in 1903 and the only person to win in two different scientific fields, and Florence Nightingale, the founder of modern nursing and a proficient statistician, broke significant barriers.

While there has been progress, a considerable gap remains. Although 55% of the Nobel Prizes awarded to women have been granted since the year 2000, women have received only 3% of the total Nobel Prizes awarded in the sciences (Schiebinger, 1999; UN Women, 2023; World Economic Forum, 2023).

Today, an expanding scientific landscape and more inclusive socio-cultural norms are creating greater opportunities for women (African Development Bank, 2019; Makerere University, 2018; MOES, 2023). In Uganda, several women hold key leadership positions in science and technology, including Honorable. Dr. Monica Musenero, the Minister of Science, Technology and Innovation, and Dr. Jane Ruth Aceng, the Minister of Health.

Affirmative action policies and the UN Sustainable Development Goals (specifically SDG 4 on quality education and SDG 5 on gender equality) are helping to mainstream the inclusion of women in Science, Technology, Engineering, and Mathematics (STEM). This has opened diverse career paths (UNESCO, 2023):

Women are holding key science leadership positions in universities, such as research offices, and industry in fields like renewable energy and healthcare, among others. Women are serving as professors, deans, and mentors for the next generation of scientists. In healthcare and medicine**,** women constitute a large portion of the healthcare workforce, making significant impacts in biomedical research and public health. Advances in technology and engineering, growing opportunities in artificial intelligence, data science, and engineering are enabling women to lead in tech startups and innovation hubs. Other women in entrepreneurship, founding and leading biotechnology firms, environmental companies, and pharmaceutical corporations.

Despite the opportunities, however, significant barriers persist, including gender bias and the underrepresentation of women in leadership roles (Zeng et al., 2016; Tripp, 2021; Casad et al., 2021). While grants and mentorship programs are crucial for building a more inclusive community, the text points out an internal challenge: the failure of some senior women to mentor and support their junior counterparts (Joshi et a., 2015; Saha, 2016; Dennehy and Dasgupta, 2017). There is a strong emphasis on the need for women to actively "pull up" fellow women in the field. At Uganda Martyrs University, we demonstrate commitment to fostering the growth of women in science through deliberate actions. We

have had and continue to implement interventions for the purpose and among others, these include:

1. Ensuring fair admission of female students to science programs.
2. Appointing female leaders to academic and administrative roles to serve as role models.
3. Establishing safe spaces and implementing safeguarding policies to ensure equal and safe engagement for all students.

In January 2025, the university hosted a symposium, in collaboration with the Organization for Women in Science for the Developing World (OWSD) and other partner institutions, to build momentum for these crucial efforts towards enabling career growth for women in the sciences. We believe in the African proverb, "you educate a woman, you educate a nation," underscoring the societal benefit of empowering women.

2
Personalexperiences on career growth for females in sciences as shared by a female-top rated African scientist

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Drawing from her personal experiences in her own journey as a top-rated African scientist, professor, wife and mother, Professor Olubukola Oluranti Babalola in her talk documented in this section focused on the challenges and strategies for women pursuing careers in science. Following are summaries of what Professor Olubukola had to say.

Navigating personal and professional challenges

Professor Babalola highlighted the multifaceted lives of women in science, who must balance demanding careers with family responsibilities. She identified the key challenges they face:

1. Work-Life Balance: juggling research, publication pressures, and family life is a significant hurdle.
2. Discrimination: women often encounter gender bias during hiring and professional advancement.
3. Systemic Barriers: navigating institutional and societal structures that may not be supportive of their careers.

Key strategies for career success

To overcome these obstacles and excel, Professor Babalola offered the following advice:

1. Develop Essential Skills: women need to build a strong portfolio of transferable skills beyond their scientific expertise. This includes communication, critical thinking, data analysis, time management, and negotiation.
2. Seek Mentorship and Role Models: finding mentors and role models is crucial for guidance and support. She stressed that "there is no wisdom in isolation" and urged women to build strong professional networks.
3. Embrace Collaboration: working with others and taking part in local and international conferences are vital for visibility, showcasing research and demonstrating career excellence.
4. Inform Policy and Practice: female scientists should ensure their research is impactful by using it to inform policies and development at both local and international levels.

5. Challenge the Status Quo: essential to challenge actively gender stereotypes and advocate for diversity in knowledge creation. Professor Babalola noted that gender equity is a driver for progress across all Sustainable Development Goals.

Foundations for a thriving career

Professor Babalola concluded by emphasizing the foundational elements required for success:

1. Education and Training: a strong educational background, continuous training and professional certifications are non-negotiable.
2. Networking and Visibility: actively taking part in relevant networks, conferences and workshops is essential for staying informed and gaining recognition.
3. Mentoring the Next Generation: successful women have a responsibility to nurture and motivate the upcoming generation of female scientists.

Ultimately, she asserted that the inclusion and support of women in science are not just matters of equity but are "essential for a sustainable future." Society has a role to play in valuing and creating an environment where female scientists can thrive.

3
Experiences and lessons for career growth for females in sciences from the perspectives of educators in higher institutions of learning

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Related to the perspectives of the trainers, mentors, and educators who work within the very institutions that shape the next generation of scientists. The author of this chapter argues that while societal barriers are powerful, higher education institutions have a unique and critical role to play in dismantling them.

Gender gaps in science will only widen if we do not make a conscious effort to change the way we teach, mentor, and support women.

This chapter outlines the challenges underlying career growth for females in the sciences, as seen from a trainer's desk and, more importantly, provides a comprehensive toolkit of strategies for change. It is a call to action for educators everywhere to become active agents in fostering a future where talent, not gender, determines success.

The challenge from the trainer's desk

From our vantage point within universities and colleges, we see the "leaky pipeline" firsthand. We see bright, enthusiastic young women enter our science programs, only to face a series of systemic hurdles that can diminish their confidence and drive them out of the field (Sadker and Sadker, 1994; Steinke et al., 2007; Ceci and Williams, 2011; Antecol et al., 2018; UN Women, 2023). Globally, women remain a minority of the world's researchers. In Africa, the average is around 34.5%, and in critical fields like ICT, women hold less than 25% of jobs (African Development Bank, 2019).

The challenges we see every day are multifaceted:

Deep-Seated Stereotypes: we see how societal stereotypes the idea that science is "for boys"—can affect a young woman's self-esteem and her willingness to speak up in a male-dominated classroom (Sadker and Sadker, 1994; Moss-Racusin et al., 2012; Nature Editorial, 2021).

Lack of Role Models: students look to the front of the classroom for inspiration. When they see very few female professors, department heads, or research leaders, it sends a powerful, unspoken message that leadership in science is not for them (Nature Editorial, 2021).

An Unsupportive System: we see how rigid academic structures, a lack of family-friendly policies, and subtle biases in funding and promotions can force women to choose between their career and their family. For too long, our institutions have operated with "gender-neutral" policies that, in reality, fail to address the real-world disadvantages that women face (UNCST, 2019).

The trainer's toolkit: Strategies for building an inclusive system

To fix this, we as trainers and educators must move from being passive observers to active builders. Here is a toolkit of strategies that higher education institutions can use to empower women in science (Ashencaen and Shiel, 2019; Akbar et al., 2023).

Rewrite the curriculum and rethink how we teach

The change must start in the classroom.

Inclusive Curricula: textbooks and course materials must actively include the contributions of female scientists. This is not just about adding a name; it is about normalizing women's presence in the history of science and providing diverse role models from the very start.

Innovative Pedagogy: we need to adopt teaching methods that are collaborative and supportive, rather than purely

competitive. This is especially important for adult women who may be returning to education, as flexible and innovative learning models can help them succeed.

Build robust mentorship and networking programs

No one succeeds alone.

Formal Mentorship: institutions should create formal mentorship programs that pair female students with experienced women in science. These mentors provide not only career guidance but also crucial emotional support and a living example of success.

Women-Centered Forums: creating networks, workshops, and conferences specifically for women in science helps build a sense of community, fosters collaboration, and combats the feelings of isolation that are all too common.

Drive institutional policy reform

Culture change must be backed by official policy.

Gender-Balanced Recruitment: institutions must adopt affirmative recruitment policies to ensure that women are equally represented in hiring, promotions, and leadership roles. A "deliberate measure" is needed to close the gender gap.

Family-Friendly Policies: to support work-life balance, universities must provide flexible work options, adequate parental leave, and accessible childcare.

Equitable Funding: we must design funding opportunities that are tailored to support women-led research projects and ensure that the grant allocation process is transparent and free from bias.

Foster a safe and supportive culture

Policies are meaningless without a culture that upholds them.

Zero Tolerance for Harassment: institutions must have strict, clear, and well-publicized anti-harassment policies. There must be safe and confidential channels for women to report discrimination and aggression without fear of reprisal.

Celebrate Women's Achievements: we need to actively create platforms to celebrate the achievements of women scientists through awards, public lectures, and media features. When women's success is visible, it becomes an inspiration to all.

Conclusion: A collaborative mission

Empowering women in science is not a task for one group alone; it is a vital mission that requires collaboration between governments, academic institutions, industries, and communities. As trainers and educators, we are on the front lines. By investing in our female students, creating supportive environments, and championing them as they rise, we can help unlock a wave of innovation and talent. The goal is clear: to create a scientific community where every bright mind has the opportunity to thrive and lead us toward a more sustainable and equitable future.

4

Experiences and lessons for career growth for females in sciences: Perspectives of educators in lower levels of education (primary school)

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Introduction

This case study provides a grassroots perspective on science education from Lydia Athieno, a veteran primary school teacher

in Iganga, Uganda. Her narrative explores the foundational challenges of teaching science, particularly the gendered perceptions of the subject among educators, and highlights the unique opportunities that arise for those who champion it. It is a compelling look at how attitudes formed in primary school can shape future career paths in science.

The core challenge: Gendered perceptions of science

Athieno identifies a fundamental problem at the primary level: many female teachers perceive science as a difficult, "male" subject, similar to mathematics. This fear leads them to avoid teaching it. When assigned the subject, their lack of confidence and enthusiasm translates into poor delivery, which in turn causes students, especially girls, to develop a negative attitude towards science from a very young age. In this, Athieno's perception of her colleagues resonates with what the literature has on barriers to women's engagement, inclusion and career growth in sciences. Making mention among others about society stereotyping that goes to influence decisions of women and girls on whether not to study and take a career path in the Sciences in general and also particularly in Uganda as can be found documented elsewhere (Blanton et al., 2020; Ceci et al., 2021; Nyadoi et al., 2023).

In contrast, Athieno, who has willingly taught upper primary science since 1997, finds the subject engaging and accessible. She argues that at this level, science is about the immediate environment and can be taught with simple language and practical examples. She herself disliked science as a student due to

intimidating terminology but grew to love it after her teacher training, demonstrating the power of effective pedagogy.

Opportunities arising from a niche expertise

Because she is one of the few female teachers in her district who is passionate and proficient in science, Athieno has gained numerous professional opportunities:

1. Subject matter expert: she is frequently invited by other schools to teach sensitive topics like reproductive health, which other teachers shy away from.
2. Leadership roles: she serves as an examiner for the district education department and is a go-to person for NGOs implementing health and nutrition projects.
3. Community influence: she has participated in radio talk shows to educate parents on child health and has led her school to win a significant competition related to Water, Sanitation, and Hygiene (WASH).
4. High demand: Athieno notes that skilled female science teachers are highly sought after, making them more marketable for transfers and valuable to their schools.

Systemic and environmental barriers

Beyond teacher attitudes, Athieno points to several systemic challenges that hinder effective science education in her context:

1. Inadequate resources: schools suffer from a lack of quality textbooks, forcing teachers to deliver "shallow" content.

2. Poor infrastructure: classrooms often lack lockable doors and windows, making it impossible to display learning aids, which are crucial for reinforcement and mastery.
3. Poverty: students often lack basic scholastic materials like books and pens, preventing them from taking notes or drawing diagrams. Furthermore, teaching hungry children is ineffective, as they cannot concentrate.
4. Curriculum issues: some topics in the primary curriculum are overly complex and would be better suited for secondary school.

Recommendations for improvement

Based on her extensive experience, Athieno proposes several concrete solutions.

For government and curriculum developers:

- Provide clear, high-quality science textbooks.
- Revise the curriculum to ensure the topics are age appropriate.
- Construct better classroom facilities to create a conducive learning environment.
- Offer regular refresher courses for teachers to build their confidence and skills.

For educators:

- Actively encourage students by framing science as an interesting subject that leads to good job opportunities.
- Incorporate practical lessons and showcase student work to parents and the community.

- Promote successful female science teachers as role models to show girls that they can excel in the field.

Athieno concludes that by building positive relationships and acting as confident role models, female science teachers can have an enormous impact on their students' academic success, preparing them for a bright future.

Part II

Learning from the past and the present,experiences, challenges and opportunities underlying career growth for females in sciences, perspectives from research

Introduction

In Part II of the book, different research work focused on highlighting the challenges, opportunities and experiences in academic and career progression of females in sciences are presented. The highlights are drawn from research in countries in East Africa, Asia and globally, and from the different disciplines encompassed in the sciences. Experiences of females in the medical fields, girls in Karamoja in Uganda, and women in Kenya, India and globally are among others highlighted. The highlights provide research evidence tallying with the narratives given by institutional leaders in Part I of this book, as well as the lived experiences presented by the females in sciences, in Parts III and IV of this book.

5
Balancing family and career: Strategies for female doctors in Uganda public medical services

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By the end of this chapter, you will be able to:

1. Identify the primary cultural and institutional challenges female doctors in Uganda face when balancing their careers and family lives.
2. Describe the coping strategies these doctors employ to manage their professional and personal obligations.
3. Analyze the proposed policy and institutional reforms designed to create a more supportive environment.

4. Explain the connection between gender equity for healthcare workers and the overall quality of public health services.

Introduction

Welcome to a chapter that explores a critical but often overlooked issue in global health: the immense pressure faced by female doctors. In any country, medicine is a demanding profession. But what happens when those professional demands clash with deeply ingrained cultural expectations about a woman's role in the family?

This chapter takes us to Uganda, where female doctors are essential to a strained public healthcare system. They are highly trained professionals on the front lines of care, yet they simultaneously navigate societal norms that assign them the primary responsibility for childcare and household duties. The author expands on the situation currently in Uganda's health sector for the women engaged. Most of her findings reported in this chapter align to most of the challenges facing females in STEM and other fields as documented in literature elsewhere (Chaudhuri and Pandey, 2019; Nakigudde et al., 2019; WHO, 2019; Hagqvist et al., 2020; Ceci and William, 2011; Ceci et al., 2021). As we will see, this creates a "dual burden" that leads to burnout, slows career progression, and impacts mental well-being.

The original research presented here uses the personal stories of female doctors to uncover the systemic and cultural barriers they face. More importantly, it highlights the creative and resilient strategies these women used to cope. By examining their challenges and their solutions, we can ask larger questions about

what true gender equity in the workplace looks like. This is not just a story about Uganda; it is a case study that sheds light on the universal struggle for work-life balance in demanding careers.

The heart of the matter: challenges for Uganda's female doctors

This study investigated the strategies female doctors in Uganda's public medical services used to balance family and career. The goal was to identify practical solutions that could improve job satisfaction, promote gender equity, and ultimately strengthen the healthcare workforce.

The core conflict: Culture versus career

In Uganda, as in much of Sub-Saharan Africa, traditional gender roles often assign women the primary responsibility for the home and children. This cultural norm creates an immediate conflict with the demanding schedule of a medical professional, leading to significant stress and feelings of guilt for female doctors.

These cultural expectations are compounded by systemic barriers within the public medical sector itself. The structure of the medical profession, with its inflexible work hours, long shifts, and limited maternity leave, was largely designed without considering the needs of caregivers. This is a global issue, but it is especially challenging in under-resourced systems. Studies from Europe and Asia show that progressive policies like flexible scheduling and subsidized childcare can make a significant difference, offering valuable lessons for Uganda.

The high stakes of imbalance

This conflict between family duties and career demands is more than just a personal struggle; it is a critical issue for public health. Female doctors are essential to Uganda's healthcare system, which already suffers from resource constraints and high patient-to-doctor ratios.

When the system fails to support these doctors, their contributions are hampered. They face a higher risk of burnout, career stagnation, and job dissatisfaction. Furthermore, cultural stereotypes can stigmatize women who prioritize their careers, undermining their professional authority. Addressing this imbalance is therefore crucial for retaining talented professionals, improving gender equity, and ensuring high-quality healthcare for all.

How we know this: The research method

To understand the personal experiences of these doctors, this study used a qualitative approach. The researchers conducted in-depth, semi-structured interviews with 20 female doctors from two major hospitals in Uganda. This method allowed the women to speak freely and in detail about their daily challenges, their coping mechanisms, and their motivations. The researchers also held focus group discussions to identify shared experiences and analyzed official documents (like labor laws and hospital policies) to understand the institutional context.

Findings from the field

The research revealed a clear picture of the challenges, coping mechanisms, and necessary reforms.

The challenges: A three-pronged problem

The women in the study described facing challenges from multiple fronts:

Workload and institutional gaps: the most immediate issue was the heavy workload, driven by chronic staff shortages. The excessive hours left little time for family. This was made worse by inadequate maternity leave and a complete lack of childcare facilities at their workplaces, creating immense barriers for mothers with young children.

Cultural and gender bias: many doctors described the powerful societal expectation to put family before their career, leading to feelings of guilt and role strain. They faced judgment from their communities and even their families. This was often coupled with gender bias at work, where they experienced discrimination in promotions and assignments, hindering their career progression.

Burnout and mental health: the combined weight of these professional and cultural pressures contributes to high levels of burnout. Many participants reported chronic stress, exhaustion, and feeling overwhelmed, which took a serious toll on their mental well-being. The lack of formal support systems within the healthcare institutions left them to manage these burdens alone.

Response: Strategies for coping

Despite the immense pressures, the female doctors developed several key strategies to cope:

Building support systems: effective time management was critical, but no one could do it alone. Doctors relied heavily on

support networks, including their spouses, extended family, and professional colleagues, for both practical and emotional help.

Delegating and prioritizing: many hired domestic help to manage household duties or worked to create a more equitable division of labor with their spouses. They also consciously prioritized self-care practices like exercise or counseling to manage stress.

Peer solidarity and advocacy: support networks of other female doctors were a vital resource. These groups provided a safe space to share experiences and advice. Some doctors also engaged in advocacy, pushing for workplace reforms like longer maternity leave and more flexible schedules.

Recommendations: Building a more supportive system

The study concludes that while individual coping strategies are important, real change must come from systemic reforms. The following recommendations were proposed to create a more equitable and supportive environment.

1. Reform official policies

Policies must be changed to reflect the needs of working parents. This includes extending maternity leave to align with international standards and developing clear, transparent policies to ensure gender equity in promotions and leadership roles.

2. Drive institutional change

Hospitals and clinics must take proactive steps. This means establishing on-site or subsidized childcare facilities to relieve a major burden for working mothers. It also requires offering flexible work

options, such as part-time schedules or telemedicine opportunities, so doctors can better manage their dual roles.

3. Shift the culture

Addressing deeply held cultural beliefs is crucial. Public awareness campaigns are needed to challenge gender stereotypes and promote the idea of shared domestic responsibilities. This can help reduce the societal pressure placed almost exclusively on women.

4. Strengthen support networks

Formal support systems can institutionalize the informal help doctors already seek. Hospitals should introduce mentorship programs pairing experienced female doctors with younger colleagues. Creating official peer support groups can also foster solidarity and provide a space for shared problem-solving.

5. Prioritize mental health

The immense stress and risk of burnout must be addressed directly. Hospitals should offer accessible counseling and mental health services tailored to the unique challenges faced by female doctors, helping them build resilience and maintain their well-being.

Conclusion: A path forward

This study makes it clear that the challenges faced by female doctors in Uganda require more than just individual resilience. A sustainable work-life balance is only possible through deliberate systemic and cultural shifts. By implementing reforms that provide flexible work, childcare support, and equitable

career opportunities, Uganda's healthcare sector can foster an environment where female doctors can thrive, not just survive. Supporting these essential professionals will not only enhance their own well-being but will also strengthen the quality of healthcare delivery for the entire nation.

6
Local leaders and girl child education: Lessons from Kampango Primary School in Karamoja region, Uganda

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By the end of this chapter, readers will be able to:

1. Describe the unique cultural and economic challenges affecting girls' education in the Karamoja region of Uganda.

2. Identify the specific actions and initiatives that local leaders undertake to promote girls' education.
3. Analyze the conflicting forces of traditional practices (like early marriage and dowry) and modern educational values.
4. Evaluate the effectiveness of local leadership and explain the key recommendations for creating systemic change.

Introduction

We have examined the complex barriers and powerful drivers affecting women in science and education across different contexts. We have seen how macro-level issues like policy, funding, and cultural norms play out in the lives of individuals. Now, in our final case study, we zoom in on a specific community to understand one of the most critical factors for change: the influence of local leaders.

This chapter takes us to the Karamoja region of Uganda, a community facing unique challenges due to its nomadic traditions, historical marginalization, and deep-seated cultural norms that as in other African settings, often prioritize boys' education over girls' (UNESCO, 2017, 2020; Lawson et al., 2020; Nyadoi et al., 2023). While national and international organizations have launched initiatives to promote gender equality in education, this research argues that their success or failure often hinges on the active engagement of community leaders on the ground.

We will explore how local chiefs, elders and activists are working to shift long-standing attitudes about the value of educating a girl. The study analyzes the specific actions these leaders take, from mobilizing parents to lobbying for resources, and measures their real-world impact on school enrollment and performance. However, as we will see, this is not a simple success story. The

research also reveals the persistent challenges that even the most committed leaders face. This chapter provides a powerful lesson in how global development goals are ultimately won or lost at the local level, through the tireless efforts of community champions.

The Karamoja context: A legacy of disparity

The Karamoja region of northeastern Uganda has a long history of marginalization. Formal education was slow to take root, and when it did, it was overwhelmingly aimed at boys. In Karimojong society, traditional gender roles are powerful, and cultural norms have historically favored educating sons while preparing daughters for early marriage and domestic duties.

This cultural preference is compounded by extreme poverty. Many families cannot afford school fees or basic supplies, and schools themselves are often under-resourced. This creates a tough environment for any child, but the challenges are magnified for girls. They are often kept at home to perform household chores, especially during planting and harvest seasons, and the tradition of dowry can create a financial incentive for parents to marry their daughters off early rather than invest in their education. As a result, Karamoja has one of the highest school dropout rates for girls in the country.

The power of local leadership: Shifting hearts and minds

This study investigated the crucial role that local leaders play in this challenging environment. Through surveys, interviews,

and focus groups with teachers, parents, students, and leaders in Kotido Municipality, the research explored how their engagement—or lack thereof—influences girls' education.

Findings at a glance: Key data from the study

The importance of education: the study found a strong consensus among teachers and students that education is vital. 100% of teachers rated girls' education as important or very important. A majority of girls (61.67%) also strongly agreed on its importance. However, a significant minority (18.33%) disagreed, reflecting the persistent influence of traditional views.

The clash of values: education versus early marriage and dowry: while 78.3% of girls strongly opposed early marriage, the practice remains a powerful cultural force. When asked if their parents valued education more than dowry, the girls' responses were mixed. Although a slight majority felt their parents prioritized education, a significant portion disagreed, confirming that the tradition of receiving a bride price (money or goods/gifts/property or any other valuables transfered from a groom's family to the bride's family in a customary marriage practice in exchange for the right to marry the bride) continues to compete with schooling.

The burden of domestic work: a major discrepancy emerged regarding housework. While 55 out of 60 girls claimed they did not miss school for domestic chores, head teachers reported the opposite. They confirmed that girls' attendance, especially in the upper grades, was significantly lower than boys', largely because

girls were kept home to work, particularly during peak agricultural seasons.

The influence of local leaders: the impact of local leaders was clear. 100% of teachers agreed that local leaders play a significant role in promoting girls' education. However, perceptions of their effectiveness were mixed. While many students saw their efforts, parents and head teachers felt that more needed to be done to achieve real gender balance.

Actions and initiatives: How local leaders make a difference

The research identified several key actions that proactive local leaders take to champion girls' education:

Community mobilization and sensitization: leaders organize community meetings, workshops, and seminars to educate parents on the long-term benefits of sending their daughters to school. They use these platforms to challenge harmful traditions and advocate for a new way of thinking.

Direct support and motivation: many leaders provide direct support, such as distributing essential school supplies like books and pens. They also visit schools to motivate students and monitor attendance, signaling to the community that education is a priority.

Lobbying for resources and scholarships: leaders often act as a bridge between their communities and external organizations. They collaborate with NGOs to secure scholarships for high-performing girls, ensuring that talented students are not forced to drop out because of poverty.

Advocating for gender balance: a growing number of leaders are now actively promoting gender equality as a core community value. They are using their influence to advocate for equal opportunities for both boys and girls, a significant shift from past generations.

Conclusion: A shared responsibility

The study concludes that while local leaders in Kotido Municipality are making positive contributions, their efforts are not yet enough to overcome the deep-rooted cultural and economic barriers facing girls. The persistence of early marriage, the burden of domestic work and the continued preference for educating boys reveal that systemic change requires a more concerted effort from all stakeholders.

Based on these findings, the following recommendations are proposed:

For the government: enforce laws against early marriage more strictly, build more boarding schools to provide safe learning environments for girls and increase the number of teachers in the region.

For non-governmental organizations: work closely with local leaders to design and implement targeted sensitization campaigns that address specific cultural barriers, such as the value of dowry versus education.

For local leaders: continue to be vocal champions for girls' education but also work to ensure that their efforts are reaching the

most resistant segments of the community. Develop clear action plans and hold themselves accountable for progress.

Ultimately, bridging the gender gap in Karamoja is a shared responsibility. By combining top-down policy support with bottom-up, grassroots leadership, it is possible to create a future where every girl has the opportunity to learn, thrive, and lead.

7
Review of the experiences, challenges and opportunities for women in the energy sector: Women in Uganda's oil and gas industry in perspective

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By the end of this chapter, readers will be able to:

1. Describe the historical context of women's entry into the global energy sector.
2. Identify the key opportunities for women in Uganda's emerging oil and gas industry, including policy, entrepreneurship, and education.
3. Analyze the primary cultural, structural, and workplace challenges that hinder women's advancement in this field.
4. Recognize the pioneering Ugandan women who are leading the way and the role of advocacy groups in supporting them.

Introduction: The new frontier for women in energy

In our journey through this book, we have explored the many facets of women's experiences in STEM and education. We have seen the global challenges, the historical struggles, and the critical importance of local leadership. Now, we turn our focus to a sector that is, in many ways, the final frontier for gender equity: the oil and gas industry.

Historically a male-only preserve, the energy sector is slowly beginning to change. This chapter takes us to Uganda, where the recent discovery of oil has created a brand-new industry, offering a unique opportunity to build a more inclusive workforce from the ground up. It examines the experiences, challenges and immense opportunities for women in this emerging field.

The chapter begins with a brief history looking at how global events like World War II first opened the door for women in

energy (Gluck, 1987; Campbell, 1993; Cottrell, 2005). The narrative then shifts to the African continent, tracing the evolution of women's roles in energy development. Focusing more closely on Uganda, it highlights the pioneering women who are shaping the nation's oil and gas industry today (Uganda Petroleum Authority, 2021, 2024). Altogether, the chapter provides a vital case study of how government policy, grassroots advocacy and individual resilience intersect to drill through the industry's glass ceiling.

A brief history: From "Rosie the Riveter" to Africa's oil fields

For most of its history, the energy sector was a world without women. The turning point came during the two World Wars, when millions of men enlisted in the military. Women were called upon to fill their roles in factories and refineries, contributing to the massive wartime production of fuel and munitions. In the United States, the cultural icon "Rosie the Riveter" came to symbolize this new, empowered female industrial worker. Women like Nancy Harkness Love, who founded the Women Airforce Service Pilots (WASP), proved that women could excel in highly technical and demanding roles.

On the African continent, progress has been slower. Even today, women represent only about 8–10% of the workforce in the extractive industries. Nigeria was one of the first African nations to see women enter its oil sector in the 1950s and 60s. Pioneers like Margaret Adebayo rose through the ranks of the Nigerian National Petroleum Corporation, and more recently, figures like Diezani Alison-Madueke (the first female President of OPEC)

and Elohor Aiboni (the first female Managing Director of Shell Nigeria) have shown that women can lead at the highest levels (Shell Nigeria, 2021).

The Ugandan context: A snapshot in numbers

Uganda's oil and gas sector is young, with major commercial discoveries made in 2006. This newness presents a unique chance to avoid repeating the historical exclusion of women. While progress has been made, there is still a long way to go.

1. 14%: The approximate percentage of the workforce in Uganda's oil and gas sector that is female.
2. 33%: The percentage of key roles held by women at the Petroleum Authority of Uganda (PAU), the industry regulator. This shows that women are better represented in governance and administrative roles than in the broader industry.

Portraits of progress: The women shaping Uganda's oil sector

Despite being a new industry, Uganda's oil and gas sector already has a number of trailblazing women in key leadership and technical positions. Their success provides a powerful roadmap for the next generation.

Proscovia Nabbanja: as the CEO of the Uganda National Oil Company (UNOC), Nabbanja is one of the most powerful figures in the industry. A geologist by training, she has been a vocal advocate for gender inclusivity and for ensuring Ugandans benefit from the sector through local content policies.

Dr. Jane Nambakire Mulemwa: a distinguished chemist, she served as the inaugural Chairperson of the Petroleum Authority of Uganda (PAU) from 2015 to 2024, overseeing the creation of the regulatory framework for the entire industry. She was recently succeeded by another woman, Lynda Biribonwa.

Irene Pauline Batebe Okello: as a Principal Petroleum Officer at the Ministry of Energy, she oversees the highly technical certification of equipment for the new oil refinery.

Irene Aheebwa: the Director of Technical Services at the PAU, she manages the country's critical data on its oil and gas reserves.

Catherine Amusugut: a Senior Geologist, she is responsible for reviewing technical proposals from international oil companies.

Juliet Nakayenga: a graduate of the Uganda Petroleum Institute, she works as a petroleum engineering technician with CNOOC, involved in the hands-on work of oil drilling and pipeline construction.

Opportunities on the horizon

As Uganda's oil and gas sector develops, several key avenues are opening up for women.

Government Policy and Advocacy: The government's National Oil and Gas Policy of 2008 (MEMD, 2008) emphasizes inclusivity, and the more recent Energy and Mineral Sector Gender Strategy (MEMD, 2022/2023) aims to directly address gender inequalities. These policies create a framework for change, while advocacy groups like the Uganda Women Network (UWONET) and the Women in Energy and Extractives Network (WEEN) push for their

enforcement and work to create platforms for women's voices to be heard.

Entrepreneurship and local content: Uganda's local content laws require that a portion of contracts go to local businesses. This creates a massive opportunity for women entrepreneurs in fields like catering, transportation, construction, and logistics. Women like Jane Mutesi (founder of JIMU Contractors Ltd.) are already seizing these opportunities.

Education and skill development: a strong focus on STEM education is critical. Institutions like the Uganda Petroleum Institute Kigumba (UPIK) are actively working to increase female enrollment, reporting a 20% rise in women joining practical courses as of 2023. These programs are building a pipeline of qualified women ready to enter technical roles.

Persistent challenges

Despite the promising opportunities, women in Uganda's oil sector still face significant barriers.

Cultural stereotypes: The perception of oil and gas as a "man's world" remains a powerful cultural barrier. Traditional gender roles can discourage girls from pursuing technical careers and lead to a lack of family support.

Access to education: While improving, access to specialized STEM training is still limited and highly competitive. The high cost and limited facilities of training institutes can be a major hurdle.

Workplace discrimination and work-life balance: women often face subtle biases in the workplace and a lack of female mentors in senior positions. Furthermore, the demanding nature of the

work—long hours, remote locations—clashes with the domestic and caregiving responsibilities that disproportionately fall on women. A lack of supportive policies, such as on-site childcare or flexible hours, makes it difficult to retain women in the long term.

Conclusion: An equitable and sustainable future

The women in Uganda's oil and gas sector prove they are not just participants, but essential leaders, technicians and entrepreneurs. The industry's youth present a golden opportunity to build an equitable and sustainable workforce from the start. However, this will not happen automatically. It requires a concerted effort from the government to enforce inclusive policies, from companies to create supportive and non-discriminatory workplaces and from society to challenge outdated stereotypes. By investing in STEM education for girls and supporting women-led businesses, Uganda can ensure that the benefits of its natural resources are shared by all its citizens, powering a more prosperous and equitable future.

8
The ultimate rise of women in STEM fields

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By the end of this chapter, you will be able to:

1. Articulate the primary challenges faced by women in STEM in Uganda, using the author's relatable analogies.
2. Explain why societal expectations and stereotypes are identified as a particularly powerful barrier.
3. Draw inspiration from the case studies of successful Ugandan women in STEM.
4. Understand the key support systems needed to encourage and retain women in these critical fields.

Introduction: A passionate plea

We analyzed data, reviewed policies and heard stories of struggle and triumph. Now, our final author, Jassa Robinah Prudence,

steps forward not just to summarize these issues, but to issue a passionate and personal call to action.

With a direct and often humorous voice, she asks us to imagine a world without female doctors, engineers, or scientists. As she points out, this is not a distant dystopia; it is close to the reality in many parts of the world, including her home country of Uganda. This chapter is a voyage, as she calls it, through the real-world barriers that keep women out of STEM as documented elsewhere too (Becker and Rosesner, 2021; Makerere University, 2018; Blanton et al., 2020; Galos and Coppock, 2023).

The author does not just present facts; she translates them into relatable experiences. She addresses the reader directly, cutting through academic formality to get to the heart of the matter. While her tone is conversational, her argument is serious and urgent. This chapter serves as a powerful conclusion, reminding us that the fight for gender equity in STEM is not just about numbers and policies; it is about unleashing a universe of human potential that is waiting to be tapped.

The problem in three pictures

In Uganda, women make up only 18% of the STEM workforce. This is not just statistics. As the author argues, it is a daily reality with real consequences. She paints a vivid picture of the three main challenges:

Underrepresentation and isolation: being one of so few women in the field leads to feelings of isolation and exclusion. The author puts it this way: "It's like being the only woman in a room full of men, trying to get a word in edgewise. Except instead of a room, it's a whole industry."

Stereotypes and bias: women in STEM constantly fight against the stereotype that they are less capable than their male colleagues. This can erode self-confidence and performance. The author describes it as "having a constant voice in your head telling you that you're not good enough. Except instead of a voice, it's a whole society." A Makerere University study found that 70% of women in STEM in Uganda experience this "stereotype threat."

The Work-Life Juggle: women are often expected to carry the primary responsibility for caregiving, making it incredibly difficult to balance a demanding career with family life. The author captures the feeling perfectly: "It's like trying to juggle a million balls while riding a unicycle. Except instead of balls, it's a career and a family."

The biggest barrier: "We're good at more than just baking"

Of all these challenges, the author singles out societal expectations as the most powerful. From a young age, girls are often steered away from STEM and toward more "traditional" female roles. The idea that math and science are "for boys" is a stubborn myth that has profound consequences.

A study by the Uganda National Council for Science and Technology (UNCST, 2019) found that women in STEM are 55% more likely to have their careers interrupted by family responsibilities than men. This is not a personal choice; it is the result of intense societal pressure. The author asks, "Why can't we just have it all? Can't we be scientists and still wear heels and lipstick?" Her point is clear: women should not have to choose between their identity and their ambition.

Portraits of power: The Amazon warriors

Despite these barriers, many Ugandan women are breaking through and achieving incredible success. The author highlights two "Amazon warriors" as role models for the next generation.

Dr. Gladys Kalema-Zikusoka: the queen of conservation medicine. Growing up in a family of conservationists, Dr. Kalema-Zikusoka pursued veterinary medicine at the University of London. She founded Conservation Through Public Health (CTPH), an organization that improves the health of humans, animals and the environment. She is a world-renowned expert, proving that a woman from Uganda can lead on the global stage.

Dr. Specioza Kazibwe: the doctor and vice president. A medical doctor by training, Dr. Kazibwe entered politics and rose to become the first female vice president in Africa. Throughout her career, she has been a tireless advocate for women's rights, tackling issues like domestic violence and promoting women's participation in leadership. She is, as the author says, "a true woman of valor and substance."

These women show that brilliance and determination can overcome immense obstacles. The problem is it should not have to be this hard.

A call to action: Plant the seed and watch it grow

The author concludes with a clear and urgent call to action. To see more women succeed in STEM, we must provide the right support and resources.

Provide mentorship and support: initiatives like the Uganda Women in STEM Initiative provide crucial mentorship and training. These programs help women navigate their careers and build a supportive community.

Encourage girls from a young age: we must actively promote STEM education for girls. The author compares this to "planting a seed and watching it grow into a beautiful flower. Except instead of a flower, it is a future scientist."

Level the playing field: ultimately, it is time to stop talking about the problem and start implementing the solutions. With the right incentives and support, the author believes we can "create women stronger than robots in STEM fields."

Her ultimate message is one of hope and urgency. The talent is there. We just need to give it a chance to flourish.

9
Perspectives from Kenya

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By the end of this chapter, you will be able to:

1. Identify the key societal, institutional, and cultural barriers that hinder the careers of women scientists in Kenya.
2. Explain the concept of the "leaky pipeline" and how it applies to women in STEM fields.
3. Describe the positive roles that mentorship, role models, and government policies play in supporting women scientists.
4. Analyze the core strategies recommended for creating a more equitable and inclusive STEM environment in Kenya.

Introduction

In the world of science, progress is driven by curiosity, rigorous methodology, and the pursuit of discovery. But for many aspiring scientists, the most significant variables they must solve have little to do with their experiments. Instead, they involve navigating

a complex landscape of societal expectations, cultural norms, and institutional barriers.

In our last chapter, we saw how female doctors in Uganda manage the dual burden of their professional and family lives. Now, we turn our attention to another critical field Science, Technology, Engineering, and Math (STEM) and travel to Kenya. Here, women scientists are breaking new ground and contributing to national development, but they often do so against a current of subtle bias and systemic disadvantages (Hagqvist et al., 2020; Global STEM Network, 2022).

This chapter explores the personal and professional journeys of these women. It reveals that the underrepresentation of women in STEM is not an accident, but the result of what researchers call a "leaky pipeline," where women are lost at every stage of their career path. Through their stories, we will examine the specific challenges they face, from stereotypes learned in childhood to biases in funding and promotions. But more importantly, we will see the powerful forces that enable their success: the vital role of mentorship, the inspiration of role models, and the slow but steady push for equitable policies.

The STEM gender gap: From global problem to local reality

It is a well-documented global fact: women are significantly underrepresented in STEM. According to a UNESCO report (UNESCO, 2020), women make up less than 30% of STEM professionals worldwide. This imbalance results from deep-rooted, systemic barriers that begin early and persist throughout a woman's career.

From a young age, societal stereotypes often steer girls away from math and science, subtly suggesting these fields are "for boys." Even for women who pursue STEM education and enter the workforce, the challenges continue. Unconscious bias can influence hiring and promotion decisions, and workplace cultures can feel isolating or even hostile. This leads to the "leaky pipeline" phenomenon, a term describing how women leave STEM careers at a much higher rate than men, worn down by a lack of support, mentorship, and work-life balance.

In sub-Saharan Africa, these challenges are magnified. Traditional gender roles often expect girls to prioritize household duties over education, and limited family finances may lead to prioritizing a son's education over a daughter's. The scarcity of female leaders and role models in scientific fields further compounds the problem, leaving young women with few guides to follow.

The Kenyan context: Good policies, stubborn barriers

Kenya has made formal commitments to gender equality through its 2010 Constitution and its Vision 2030 development plan. These frameworks recognize the critical role of women in all sectors, including STEM.

However, policy on paper does not always translate to reality on the ground. Despite these progressive goals, Kenyan women in STEM still face significant hurdles. Deeply ingrained cultural norms continue to channel women toward "traditional" careers, while institutional practices—from how subjects are taught in school to how research funding is allocated—can perpetuate gender bias. Despite the remarkable success of Kenyan women

like Nobel laureate Wangari Maathai, systemic change remains slow. This study sought to understand why by listening directly to the women navigating this path.

How we know this: The research method

To capture the rich, personal experiences of women scientists in Kenya, this study used a qualitative research approach. The researchers conducted in-depth interviews with women at all stages of their careers, from early-career researchers to seasoned leaders. This allowed them to gather detailed stories about the specific challenges, successes, and support systems that defined their journeys. The researchers also used thematic analysis to identify common patterns across these stories, cross-referencing their findings with institutional reports and policy documents to build a comprehensive picture.

Findings: The obstacle course for women in STEM

The research revealed a clear set of obstacles that hinder the progress of women scientists in Kenya.

Societal and Cultural Hurdles: The first barrier is often cultural. Deeply ingrained societal norms and traditional gender roles create a discouraging environment, limiting the support girls and women receive from their families and communities when they aspire to a career in science.

Institutional Bias: The second barrier is found within institutions. Women reported facing biases in hiring, promotions, and, critically, access to research funding. This creates an uneven playing

field where equally qualified women can be overlooked, stalling their careers.

Challenging Work Environments: Finally, the workplace itself can be a barrier. Some women described isolating or unsupportive work environments. A significant challenge is the lack of family-friendly policies, such as flexible work hours or adequate parental leave. This forces many women to make an impossible choice between their career and their family, contributing directly to the "leaky pipeline."

Forces for change: Mentors, role models, and policy

Despite the obstacles, the study also identified powerful enablers that help women succeed.

The Power of Mentorship: Mentorship programs emerged as a crucial lifeline. Initiatives like the UNESCO-STEM Government of Kenya program, which runs science camps and provides guidance, have had a clear, positive impact on encouraging girls and supporting them in their careers. Mentors provide not only technical guidance but also vital encouragement and a roadmap for navigating institutional challenges.

The Inspiration of Role Models: The presence of successful women scientists is profoundly motivating. Towering figures like Wangari Maathai serve as powerful, visible proof of what is possible. Their stories of resilience and achievement inspire others to persevere in their own aspirations.

The Promise of Policy: Government action is another key enabler. Kenya's 2020–2030 Science, Technology, and Innovation (STI)

Policy demonstrates a commitment to building a more inclusive STEM sector. Such policies provide the necessary framework to begin addressing systemic challenges and promoting quality education and research for women.

Conclusion and recommendations: A blueprint for equity

The underrepresentation of women in STEM in Kenya is a complex problem, but it is not unsolvable. The research points to a clear, multi-pronged strategy for building a more inclusive and equitable scientific community.

The following recommendations are crucial for moving forward:

Strengthen and Expand Mentorship: We must invest in robust mentorship programs that support women at every stage of their careers. The success of existing programs shows that providing guidance, support, and practical skills is one of the most effective ways to help women thrive.

Enforce Gender Equity Policies: Strong policies like Kenya's Vision 2030 and STI policy provide an excellent framework. The next step is to ensure they are fully implemented and enforced across all institutions to create a truly level playing field in hiring, promotion, and funding.

Challenge Stereotypes from an Early Age: We must fundamentally shift our educational approach. Curricula and teaching methods should be revised to present STEM as an exciting and accessible field for everyone, regardless of gender. Early-intervention

programs aimed at inspiring girls can break down stereotypes before they take root.

With these strategies, Kenya can move from simply identifying the problem to actively building the solution. In doing so, it can unlock the full potential of its women scientists and, in turn, accelerate the nation's progress.

10
Perspectives from India

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By the end of this chapter, you will be able to:

1. Identify the key societal, cultural, and institutional challenges that women in physics face in India.
2. Describe the "double bind" of balancing professional ambitions with traditional family roles.
3. Explain the role of specific government policies, fellowships, and mentorship programs in empowering women scientists.
4. Analyze why bridging the gender gap in physics is essential for India's future growth in science and innovation.

Introduction

In our previous chapter, we explored the long and often overlooked history of women in physics, recognizing the brilliant pioneers who pushed the boundaries of science against incredible

odds. Now, we bring that historical and global lens to a specific and dynamic context: modern India.

India is a nation of stark contrasts, a global leader in science and technology that is simultaneously navigating deep-seated cultural traditions. This creates a unique paradox for women who aspire to a career in physics. They are entering a field crucial to the nation's future, yet they often find their paths constrained by societal expectations, institutional biases, and a lack of practical support.

This chapter delves into this complex reality. It examines the powerful cultural and structural barriers that create a "double bind" for many women, forcing them to balance immense professional demands with traditional domestic responsibilities. But this is not just a story of challenges. We will also explore the powerful counter-current of change: government policies designed to promote equity, the vital role of mentorship networks, and the inspiring success stories of women who are forging a new path. This case study of India provides a crucial lesson in how the universal struggle for gender equity is shaped by local realities.

The double bind: Navigating culture and career in Indian physics

While India has made enormous strides in science, the field of physics remains predominantly male. The underrepresentation of women is not just a reflection of global trends; it is deeply intertwined with the nation's unique cultural landscape. Women in physics often face a "double bind," caught between the high

demands of their profession and the powerful weight of societal expectations (Bell, 2018; Bhattacharya, 2018; Chaudhuri and Pandey, 2019; Baker and Lee, 2020).

The first hurdle: Societal and cultural expectations

In many parts of Indian society, traditional gender roles remain influential. There is often a cultural expectation that women should prioritize domestic responsibilities like childcare and household management over their careers. Physics, with its reputation as a difficult, "masculine" field, is often discouraged for young girls, who may be steered toward other paths. This can lead to a lack of encouragement from family and even teachers, creating a powerful psychological barrier before a woman's career even begins.

The second hurdle: Institutional barriers

For women who overcome these cultural hurdles, the academic and research institutions themselves present a new set of challenges.

Lack of Supportive Infrastructure: Many institutions were not designed with the needs of working mothers in mind. A lack of gender-sensitive policies such as adequate maternity leave, flexible working hours, or on-site childcare facilities makes it incredibly difficult for women to sustain a demanding research career while managing family life.

Implicit Bias and Lack of Mentorship: Research environments have historically been male dominated. This can lead to implicit biases in hiring, promotions, and funding decisions, where a

woman's contributions might be unconsciously undervalued. Furthermore, with few women in senior positions, there is a scarcity of role models and mentors who can guide younger women, help them build professional networks, and show them a viable path to leadership.

This combination of pressures contributes directly to the "leaky pipeline," where women, exhausted by the struggle to maintain a work-life balance without adequate support, leave the field at a much higher rate than their male peers.

Forging a new path: Opportunities for empowerment

Despite these significant hurdles, a powerful counter-narrative of empowerment and progress is emerging in India. A growing awareness of the gender gap has led to the creation of targeted initiatives designed to support women in physics.

Government Policies and Funding: The Indian government has launched several key initiatives to promote gender equity. The Women Scientist Scheme (WOS), created by the Department of Science and Technology (DST), is a vital program that provides fellowships and career opportunities for women researchers, especially those looking to re-enter the field after a career break for family reasons. Such policies provide a crucial financial lifeline and a structured pathway back into science.

The Power of Networks and Mentorship: Recognizing the importance of community, organizations like the Indian Women's Scientist Association (IWSA) are providing platforms for women to connect, collaborate, and find mentors. These networks are

invaluable for combating the feelings of isolation many women experience, offering guidance, emotional support, and opportunities to build professional visibility.

A Shift Within Institutions: Some leading research institutions are creating more inclusive environments. By prioritizing collaboration over competition, actively recruiting women, and implementing more supportive policies, these institutions are demonstrating that a different kind of scientific culture is possible.

The Inspiration of Success Stories: The rise of prominent female physicists in India is one of the most powerful drivers of change. The success of women like Dr. R.S. Soni, who became the first female head of a physics department at a premier university, serves as a potent and visible inspiration. These role models prove to the next generation that gender is not a barrier to reaching the highest levels of scientific achievement.

Conclusion: Unlocking India's full scientific potential

The journey for women in physics in India is one of overcoming persistent challenges through resilience, strategic support, and a growing movement for systemic change. While societal biases and institutional barriers remain, the targeted efforts of government, dedicated organizations, and pioneering individuals are creating real opportunities.

To continue this progress, a multi-pronged approach is essential. This includes:

1. Enforcing more inclusive recruitment and promotion practices.

2. Investing in supportive infrastructure like childcare at research institutions.
3. Expanding mentorship networks to reach women across the country.
4. Reforming school curricula to challenge gender stereotypes from a young age.

By bridging the gender gap, India can ensure that its scientific community is diverse, equitable, and fully equipped to tackle the challenges of the twenty-first century. Unlocking the full potential of its women physicists is not just a matter of fairness; it is essential for securing the nation's future as a leader in global science and innovation.

11
Empowering women in science for a sustainable future: A global perspective

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By the end of this chapter, you will be able to:

1. Describe the current global status of women in STEM fields, using key statistics for context.
2. Identify the primary cultural, institutional, and personal barriers that hinder women's careers in science.
3. Explain the key strategies from education to policy reform that can be used to empower women in science.
4. Articulate the crucial link between gender equity in science and the achievement of global sustainability goals.

Introduction

In the previous chapters, we took a close look at the professional lives of women in specific scientific fields and countries. We saw the dual burdens faced by female doctors in Uganda and the systemic barriers navigated by women scientists in Kenya. These stories gave us a powerful, on-the-ground view of the fight for gender equity in STEM.

Now, we are going to zoom out. This chapter connects these individual struggles to one of the most urgent missions of our time: achieving a sustainable future. The author argues that empowering women in science is not simply a matter of fairness or social justice. It is a strategic necessity for solving our planet's biggest challenges, from climate change and energy innovation to public health and food security.

We will explore the global landscape, looking at the data that reveals where women stand in STEM fields worldwide (UNESCO, 2017, 2020, 2021; UN Women, 2023). We will then break down the persistent barriers that create a "leaky pipeline" and examine a comprehensive toolkit of strategies for fixing it. Finally, through inspiring case studies, we will see living proof of how the contributions of women are already shaping a more sustainable world. This chapter makes the case that without women at the table and in the lab, our efforts to build a better future will be incomplete.

The global landscape: A snapshot in numbers

Despite decades of progress, a significant gender gap persists in STEM fields across the globe. The data tells a clear story.

According to UNESCO, only about a third of the world's researchers are women (UNESCO, 2020). This disparity varies by region and field, but the overall trend is undeniable.

In fields like engineering and computer science, women are even more underrepresented.

In leadership, the gap is wider. Women hold fewer than 25% of senior academic positions and are rarely in key decision-making roles that shape scientific priorities.

In recognition, the disparity is stark. Since its inception, only 4% of Nobel Prizes in scientific categories have been awarded to women.

This imbalance is not because of a lack of talent or interest. It is the result of systemic obstacles that women face at every stage of their journey, a phenomenon often called the "leaky pipeline."

The obstacle course: Why the gender gap persists

Women leave scientific careers at higher rates than men not for one single reason, but because of a series of interconnected challenges.

Cultural and Societal Barriers: Deep-rooted stereotypes often portray science as a "male" domain, discouraging girls from a young age. Societal expectations that assign women's primary responsibility for caregiving and household duties create a work-life imbalance that can make a demanding scientific career feel unsustainable.

Educational Hurdles: The pipeline often begins to leak in school. A lack of encouragement, a shortage of visible female role

models, and subtle biases in the classroom can lead girls to opt out of STEM subjects before they even reach university.

Workplace Disparities: For women who do enter scientific careers, the workplace itself can be a major barrier. They often face a gender pay gap, are overlooked for promotions, and may experience harassment or discrimination. This exclusion from professional networks can lead to feelings of isolation and what is known as "impostor syndrome," a persistent self-doubt despite clear evidence of their competence.

Funding and Resource Inequality: Research shows that women scientists often receive smaller research grants and face higher rejection rates than their male colleagues. This bias in funding directly limits their ability to conduct innovative research and advance in their fields.

Portraits of progress: Stories of impact

Despite the barriers, women have always made groundbreaking contributions to science. These stories are not just inspiring; they are proof of the immense potential that is unlocked when women are empowered.

Marie Curie: The first woman to win a Nobel Prize (and the only person to win in two different scientific fields), her pioneering work on radioactivity paved the way for modern physics and medicine.

Wangari Maathai: A Nobel laureate from Kenya, she founded the Green Belt Movement,

which has planted over 50 million trees to combat deforestation and empower communities, directly linking environmental action with social justice.

Dr. Kizzmekia Corbett: An American immunologist, she was a lead scientist in developing the Moderna COVID-19 vaccine, demonstrating the critical importance of diverse perspectives in solving global health crises.

Dr. Gladys West: An American mathematician, her work on satellite data was instrumental in developing the GPS technology we all rely on today, though her contributions went largely unrecognized for decades.

Dr. Jennifer Doudna: A co-developer of the CRISPR gene-editing technology, her work has revolutionized genetics and earned her the 2020 Nobel Prize in Chemistry, opening new frontiers for curing diseases.

Institutional efforts like the L'Oréal-UNESCO "For Women in Science" Program and national initiatives like Rwanda's commitment to STEM education for girls show that when support is deliberate, the results are transformative.

The toolkit for change: Strategies for empowerment

Addressing the gender gap requires a multi-faceted approach that tackles the problem from every angle.

1. Start early: Education and exposureWe must encourage interest in STEM from a young age. This includes reforming school curricula to highlight the contributions of women scientists, training teachers to eliminate unconscious bias, and creating hands-on science clubs that are welcoming to girls.
2. Build support systems: Mentorship and networksMentorship is critical. Pairing aspiring scientists with experienced professionals provides invaluable guidance and support. Creating professional networks specifically for women allows them to collaborate, share experiences, and build solidarity.
3. Fix the system: Inclusive workplaces and fair funding Institutions must change. This means implementing family-friendly policies like flexible work schedules and parental leave. It requires establishing clear anti-harassment policies and ensuring transparency in hiring and promotions. Funding bodies must also address bias in grant allocation to ensure women-led research gets the support it deserves.
4. Increase visibility and recognitionWe need to actively showcase the achievements of women scientists through awards, media campaigns, and public lectures. When girls see successful women in these fields, it becomes easier for them to envision a future for themselves there.
5. Advocate for policy changeGovernments must adopt and enforce gender-inclusive policies in education, employment, and research funding. These efforts should align with global frameworks like the UN Sustainable Development Goals, particularly SDG 5 (Gender Equality).

Conclusion: An equation we can't afford to get wrong

Empowering women in science is not just a secondary goal; it is a prerequisite for building a sustainable and prosperous future. The diverse perspectives, innovative solutions, and collaborative approaches that women bring are essential for tackling the complex challenges facing our planet. By systematically dismantling barriers and fostering an inclusive environment, we can unlock a vast reserve of human potential. The time to act is now, because achieving gender equity in science is vital for the well-being of our society and the survival of our planet.

12

Galaxies of potential: Encouraging females in the cosmos of physics

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By the end of this chapter, you will be able to:

1. Identify the historical contributions of key women in physics and the pattern of their under-recognition.
2. Explain the primary barriers (societal, institutional, and educational) that contribute to the "leaky pipeline" in physics today.
3. Describe effective, multi-level strategies for fostering a more inclusive and equitable environment in the field.
4. Articulate why gender diversity is not just a matter of fairness but is essential for the future innovation and success of physics.

Introduction: A universe of untapped talent

In our journey so far, we have explored the systemic challenges and triumphs of women in STEM across different fields and regions. We have seen how gender equity is not just a social goal but a critical component of building a sustainable future. Now, we zoom in on one of the most foundational and, paradoxically, one of the least gender-diverse sciences: physics.

Physics is the discipline of cosmic questions, a field where curiosity knows no theoretical limits. Yet, here on Earth, it is constrained by very real, human-made barriers. Globally, women remain starkly underrepresented, creating a massive loss of talent, creativity, and perspective for the field (Steinke et al., 2007; Moss-Recusin et al., 2012; Nature Editorial, 2021; Casad et al., 2021; World Economic Forum, 2023).

This chapter examines this paradox. We will begin by traveling back in time to meet the "invisible pioneers"—brilliant women whose groundbreaking contributions to physics were often overlooked or credited to their male colleagues. Their stories reveal how deep the roots of exclusion run. We will then analyse the modern barriers, from stereotypes in the classroom to biases in the lab that create a "leaky pipeline" today. Finally, we will explore a powerful toolkit of strategies for creating a more inclusive future, arguing that unlocking the full potential of physics requires us to first unlock the full potential of all its physicists.

Ghosts in the machine: The invisible pioneers of physics

To understand the challenges women face in physics today, we must first look to the past. The history of the field is filled with the stories of brilliant women who broke through immense barriers, often only to have their work ignored or attributed to others. Their legacies serve as both an inspiration and a cautionary tale (Galos and Coppock, 2023; WHO, 2019; UN Women, 2023; World Economic Forum, 2023).

Marie Curie (1867–1934): The most iconic woman in science, Curie was the first woman to win a Nobel Prize and the only person ever to win in two different scientific fields (Physics and Chemistry). Her research on radioactivity fundamentally changed our understanding of the atom, but she still had to fight for recognition in a deeply skeptical, male-dominated establishment.

Lise Meitner (1878–1968): A key mind behind the discovery of nuclear fission, Meitner provided the theoretical explanation for the experiments of her colleague, Otto Hahn. Yet, when the Nobel Prize was awarded for the discovery in 1944, only Hahn received it. Her exclusion is a classic example of women's contributions being erased from the official record.

Chien-Shiung Wu (1912–1997): Known as the "First Lady of Physics," Wu conducted a brilliant experiment that disproved a fundamental law of physics (the law of parity conservation). Her work was essential, yet the 1957 Nobel Prize for the discovery went to her two male colleagues who had developed the theory.

Vera Rubin (1928–2016): Rubin's pioneering observations of galaxy rotation provided the first direct evidence for the existence of dark matter, a substance now believed to make up most of the universe. Her discovery was one of the most important of the 20th century, but she was never awarded a Nobel Prize, sparking widespread debate about gender bias in the prize committee.

These women, and countless others, laid the groundwork for modern physics. Their stories reveal a persistent pattern of systemic bias that has taken generations to dismantle.

The leaky pipeline: Why does physics lose so many women?

The underrepresentation of women in physics is often described as a "leaky pipeline," where women leave the field at every stage of the academic and professional ladder. This is not a single event, but a slow drain caused by a series of interconnected barriers.

The problem starts early: Education and stereotypes

The leak often begins in elementary and high school. From a young age, children are exposed to the stereotype that boys are naturally better at math and science. This bias, whether conscious or not, can come from teachers, parents, and even the curriculum itself. Physics is often taught in an abstract way that can feel unrelatable, and textbooks rarely feature female role models. As a result, many girls with a genuine interest and aptitude for science begin to doubt their abilities and are subtly steered away from the field.

The obstacle course of academia: Bias and hostile environments

For women who persist and enter university to study physics, the environment can be isolating and even hostile. They are often among only a few women in their classes. Studies have shown that unconscious bias is rampant; both male and female faculty have been shown to rate male candidates as more competent than identical female candidates. This bias affects everything from grades and letters of recommendation to hiring and promotions. Many women also report experiencing "microaggressions"—subtle but persistent acts of exclusion, like being talked over in group discussions or having their expertise questioned.

The double bind: Work-life balance

A career in physics demands long hours, intense focus, and often international travel. These demands clash with societal expectations that still place a disproportionate share of caregiving and family responsibilities on women. Many academic and research institutions lack family-friendly policies like flexible work hours, adequate parental leave, or on-site childcare. This structural barrier forces many women to make an impossible choice between their career and their family, creating a major leak in the mid-career pipeline.

Fixing the pipeline: A toolkit for an inclusive future

Addressing these deep-rooted challenges requires a deliberate, multi-pronged approach. There is no single solution, but

a combination of strategies can create a more supportive and equitable environment.

Rewrite the Narrative: We must actively challenge stereotypes in education. This means reforming curricula to include the achievements of women physicists, training teachers to recognize and correct their unconscious biases, and showcasing visible female role models in classrooms and the media.

Build Bridges Through Mentorship: Formal mentorship programs that connect young women with experienced female physicists are incredibly effective. Mentors provide not only academic and career guidance but also crucial emotional support and proof that success is possible.

Change the System, Not the Women: Institutions must reform their policies. This includes implementing blind review processes for hiring and grant applications to reduce bias, establishing clear and strict anti-harassment policies, and providing family-friendly benefits like parental leave and childcare support.

Foster Collaborative Communities: Shifting the culture of physics from one of intense competition to one of collaboration can make a huge difference. Creating supportive networks, like the American Physical Society's Committee on the Status of Women in Physics, helps reduce feelings of isolation and fosters a sense of belonging.

Conclusion: A universe of potential

The future of physics is bright, but it will only reach its full potential when it draws on the talent of all humanity. The path forward

requires a sustained commitment to dismantling the barriers that have historically excluded women. By fostering inclusive educational environments, reforming institutional policies, and celebrating the contributions of women, we can stop the leaks in the pipeline. The growing presence of women in leadership roles is already inspiring a new generation. By ensuring their place in the lab, in the classroom, and in the leadership of major scientific projects, we will not only enrich the field of physics, but we will be better equipped to explore the mysteries of the cosmos and solve the most pressing challenges here on Earth.

13

Shared journeys: Experiences of women in the sciences in East Africa

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By the end of this chapter, you will be able to:

1. Describe the shared historical context that has shaped women's participation in science across East Africa.
2. Identify the key opportunities, including educational programs and government policies, that are available to women in the region.
3. Analyze the systemic challenges, such as gender stereotypes and funding disparities, that women in STEM continue to face.

4. Evaluate the proposed strategies for creating a more inclusive and equitable scientific community in East Africa.

Introduction

We have journeyed through specific landscapes of challenge and opportunity for women in Science, Technology, Engineering, and Math (STEM). We have delved into the worlds of female doctors in Uganda, physicists in Kenya, and oil and gas pioneers on a new frontier. Now, in this concluding chapter, we pull the camera back to see the bigger picture. We will weave these individual threads together to understand the shared experiences of women in science across the entire East African region (UNCST, 2019; Rwanda Science and Innovation Council, 2022; and Tanzania Bureau of Statistics, 2023).

This chapter synthesizes the key themes we have encountered. It examines the common historical roots of gender disparity in the region and explores the contemporary experiences of women navigating these fields today. We will look at the powerful opportunities being created by new educational initiatives and progressive government policies. At the same time, we will confront the persistent challenges from deep-seated cultural stereotypes to systemic funding gaps that continue to hinder progress.

By taking this broader, regional view, we can identify patterns and propose solutions that are not just country-specific but can help uplift women in science across East Africa. This chapter serves as a capstone, reinforcing the central message of our study: unlocking the full potential of a region depends on unlocking the full potential of all its people.

The shared journey: Experiences of women in East African science

The story of women in science across East Africa is one of both remarkable progress and stubborn, persistent barriers. Historically, colonial-era education systems were heavily skewed in favor of men, creating a legacy of female underrepresentation in all professional fields, especially the sciences.

Today, that legacy is being challenged by a new generation of women who are forging paths in academia, policy and global advocacy.

Case Study: Leadership in Tanzania. Dr. Joyce Ndalichako's career is a testament to resilience. She began as a secondary school teacher and rose to become Tanzania's Minister of Education, where she became a pivotal force in promoting science education for girls. Her journey highlights the power of individual determination in overcoming systemic hurdles.

Case Study: Advocacy from Kenya. Dr. Esther Ngumbi, a renowned entomologist and food security expert, has become a global advocate for STEM education. Her success reshapes the narrative of what is possible. However, her story also stands in contrast to the reality for many rural Kenyan girls, who still face the immense barriers of early marriage and a lack of resources, which often cut their educational journeys short.

These experiences show that while individual talent and drive can break barriers, systemic support is needed to ensure that every girl has the same opportunity.

A landscape of opportunity

Across East Africa, a growing network of opportunities is being created to support women in science.

Expanding Access to Education: The number of science-focused institutions is growing. Crucially, non-governmental organizations (NGOs) are stepping in to fill the gaps. Groups like Akili Dada in Kenya and the Tanzania Education Network (TEN/MET) are providing targeted scholarships and mentorship programs specifically for girls who wish to pursue STEM fields.

Progressive Government Policies: Governments are increasingly recognizing that gender equity is essential for national development. Uganda's Gender in Education Policy, for example, mandates quotas to increase female participation in university STEM programs. These policies send a powerful top-down message that women belong in science.

The persistent challenges

Despite this progress, significant challenges remain deeply embedded in the cultural and institutional fabric of the region.

Gender Stereotypes and Discrimination: The most pervasive barrier is the cultural view of science as a "male" domain. This stereotype discourages girls from a young age and follows women into the workplace. A UN Women report found that 60% of women in STEM fields report experiencing workplace discrimination (UN Women, 2021; 2023).

The Funding Gap: Women researchers often face a significant disadvantage when competing for research grants. Funding

agencies may have an unconscious bias that favors projects led by established male scientists. In Uganda, for example, a study by the African Development Bank found that female-led startups in agricultural technology struggled to secure funding, even when their solutions were highly innovative. This systemic inequity starves female-led innovation of the resources it needs to grow.

Conclusion: A call for systemic change

The journey of women in science across East Africa is a story of incredible achievement in the face of significant obstacles. To build on this progress, the region must move beyond celebrating individual success stories and commit to fundamental, systemic change.

The path forward requires a unified approach:

Policy and Institutional Reform: Governments and institutions must not only create but also rigorously enforce policies that promote equal pay and have zero tolerance for discrimination. Rwanda provides an excellent model, having successfully integrated gender equity clauses directly into its National Science Policy.

Cultural Transformation: A concerted effort is needed to challenge stereotypes from the ground up in classrooms, in the media, and within communities to normalize the idea that science is for everyone.

Investing in Women-Led Innovation: Governments and private investors must actively work to close the funding gap,

ensuring that the innovative ideas of women scientists receive the resources they need to flourish.

By embracing these strategies, East Africa can unlock the immense potential of its female scientists, driving innovation, fostering sustainable development, and creating a more equitable future for all.

14
Reflections on perceived role models and personal experiences

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By the end of this chapter, you will be able to:

1. Understand the importance of personal role models, like a parent, in shaping a young woman's interest in science.
2. Identify the key opportunities and challenges for girls in science from a student's lived perspective.
3. Recognize the vital role that school-level activities, like STEM clubs, play in fostering engagement.
4. Appreciate the key recommendations for creating a supportive "village" for the next generation of female scientists.

Introduction

We have heard from researchers, analyzed policies, and reviewed historical trends. It is only fitting that we give the final word to

a voice from the very generation this work is meant to inspire. In this chapter, we hear directly from Nabangi Daisy, a 17-year-old secondary school student from Iganga, Uganda. She shares her personal journey with science, a path shaped by the powerful role model of her mother, a science teacher and now head teacher. With honesty and insight, Daisy reflects on her experiences in the classroom, the opportunities she sees on the horizon, and the daunting challenges that still stand in the way.

This is not a formal academic paper. It is a heartfelt first-person testimony. Daisy's voice is authentic, passionate, and direct. She offers a crucial on-the-ground perspective on what it feels like to be a young woman falling in love with science today. Her story is a powerful reminder of why this work matters and a call to action to support the generation that will shape our future.

My foundation: A mother and a question

My name is Nabangi Daisy. To me, career growth is the big picture—the overall progress you make in your professional life. While I don't have a career yet, I have seen women grow in science my whole life, from agriculture to education to health. The best example I have is my mother, Mrs. Athieno Lydia Nabangi, who has been a science teacher since 1997 and has now excelled to the post of Headteacher. In my 17 years, I have seen the reality for women in science: their experiences, their opportunities, and their challenges.

My own experience started in primary school with two subjects: science and mathematics. I learned that math was the

science of structure, space, and change. You could even get the right answer with the wrong method. But science was different. It was about applying knowledge and understanding the world through evidence. It was a collection of facts, like, "respiration is the burning down of food with oxygen to produce heat and energy." Science was a whole other world. As I learned science, I noticed that most of the science teachers at my primary school were male. This bothered me because at home, my mother was a female science teacher. This question led me to a report from Busitema University, which included a table on the percentage of women earning science degrees.

A look at the data trend from Makerere (2018) on women in science degrees between 2001 and 2010,

What This Data Shows: While women have a strong presence in biology (especially at the bachelor's and master's levels), their representation drops significantly in fields like physics and engineering. The good news is that at the highest level (PhD), the percentage of women increased in every single field between 2001 and 2010, showing slow but steady progress.

Bringing science to life: My school experience

A few months after finding that report, my own fate was "twisted with science," but it was more complicated than in primary. Science has now broken into six subjects: biology, chemistry, physics, physical education, agriculture, and food and nutrition.

At my school, we had a STEM club (Science, Technology, Engineering, and Mathematics) that aimed to inspire us and

develop critical thinking skills. We also had a YOFFA club (Young Farmers Club), which partnered with the AVSI Foundation to give a "grow and a light" to all the females interested in farming. My school held science fairs and SSESEMAT meetings, but the most interesting part was the number of females who participated. To me, it was a "woman in science thing," promoting equality in careers and leadership. The club and science departments at my school had women in different leadership roles, which encouraged all of us.

The double-edged sword: Opportunities and challenges

Based on what I've seen, here are the major opportunities and challenges for women in science.

The opportunities

Scholarships: Uganda offers scholarships for women to study in countries like China, India, and the United States of America. This gives them a chance to perfect their abilities, gain new skills, and outshine societal stereotypes.

Favorable Government Policies: Policies like the 2018 Gender in Education Policy aim to increase the number of girls in science classes and train teachers to teach STEM subjects better.

Supportive University Programs: Makerere University's affirmative action policy reserves 40% of spots in STEM disciplines for women. They also have mentorship programs that train and support female students in their final year. These pathways encourage hard work.

Table 14.1: below shows the percentage of degrees awarded to women in the sciences:

Degree	Subject	2001	2010
Bachelor's (BS)	Biology	59.7%	59.9%
	Chemistry	48.6%	41.1%
	Physics	21.9%	20.8%
	Engineering	26.1%	21.1%
Master's (MD)	Biology	57.9%	58.0%
	Chemistry	41.1%	48.5%
	Physics	20.8%	22.7%
	Engineering	21.2%	22.3%
Doctorate (PhD)	Biology	44.1%	52.9%
	Chemistry	33.7%	38.8%
	Physics	14.3%	19.4%
	Engineering	16.6%	23.2%

Networking: Connecting with other people—investors, employers, and government officials—is crucial. It helps women find mentors and learn from their experiences.

The challenges

Societal Stereotypes: The biggest challenge is the societal perception that a girl's destiny is to marry, have children, and cook. This perception hinders so many girls, because sometimes even their own parents side with society. A UN report showed that 85% of the world's population believes men make better political leaders, and two in five think men are more capable business executives (WHO, 2019; UN, 2023). This causes low self-esteem and pushes women away from STEM to humanities.

Gender Disparities at Work: The pay gap between men and women widens about five years into their careers. This is due

to many reasons, from career interruptions for childbirth to deeply rooted cultural discrimination. Women are constantly required to prove themselves, working twice as hard as their male colleagues. This leads to a heavy decision: "one can't serve two masters at once. You either become a bad mother and partner or you lose the job."

Corruption: This is a devastating challenge. Some women are forced to use their bodies as payment or pay huge bribes to advance in their careers. This can lead to unwanted pregnancies, STDs, death by suicide or unsafe abortion. It is a path that can lead to giving up entirely.

Conclusion: It takes a village

In conclusion, if society would come together and hear the voices and views of all the females who have found success in the science field, it would proudly support all the females who want to choose science as their career path. Remember, it takes a whole village to raise a child. Thank you.

Recommendations

1. Provide Female Mentors in STEM: We need role models like Dr. Olive Kobusingye, Lorna Maria Aino, Betty Kituyi, and Zilla Mary Arach. They can act as a torch and a support system for all the girls and young women interested in STEM.
2. Support Work-Life Balance: Offer professional and program support to help women meet both career and family obligations. This can be done by holding conferences where women who hold big titles in STEM can share their stories and experiences.

3. Sensitize Society: We need to sensitize the entire society about gender equality to help support females pursuing their careers without hindrance. This can be done by holding meetings at the district level.
4. Use Media to Fight Corruption: Use media-newspapers, WhatsApp, Facebook, Twitter—to raise a voice for women who face corruption and sexual harassment. This will raise public awareness and encourage people to stand up for victims.

15
Lived experiences of females in sciences, a panel discussion

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Introduction

Franny Martha Alaroker: Overcoming trauma and the double burden

Franny Martha Alaroker's journey was shaped by a powerful internal drive and significant external obstacles.

1. Motivation: Growing up in a large family with an uneducated parent, she was motivated by her mother, a primary school teacher, who instilled in her the belief that she could "do far much better than even the boys." This encouragement pushed her to excel in science.
2. Challenges:
    - Regional Insecurity: Her secondary education was severely disrupted by the Lord's Resistance Army insurgency in her region. The constant need to flee for safety and the emotional trauma of having classmates abducted directly impacted her ability to study.
    - Balancing Family and Career: As a young mother, she faced the immense challenge of balancing the demanding roles of career and family.
    - Financial Responsibility: She had to teach at three different secondary schools simultaneously to support her siblings' education, which significantly limited the time she could dedicate to her own career growth.
3. Opportunities and advice: Despite these hardships, she seized opportunities like a full scholarship specifically for women in science. Her key recommendation is the urgent need for career guidance and mentorship structures at lower educational levels, particularly in secondary schools.

She believes early mentorship is critical to help young girls stay focused and achieve their potential.

Amel-Elsati Mustafa: Literacy, progress, and a ray of hope

Amel-Elsati Mustafa focused on the broader connection between women's literacy, professional development, and systemic progress.

i. Core Argument: She linked women's educational levels directly to their advancement in professional fields. While the challenge of balancing career and academic pursuits remains a significant hurdle, she noted that when women are given opportunities; they excel in both academia and community engagement.
ii. Evidence of Progress: She provided statistics showing a positive trend in women's enrollment in organizations, rising from 8 to 10% in 2019 to a projected 14% in 2025. She framed this as a "ray of hope" that by the end of the SDG period in 2030, women's representation will have increased significantly.

Nosiba Abd Elhaleem: Finding purpose in science

Nosiba Abd Elhaleem, a student at the University of Oxford, shared a story of evolving purpose and using science as a tool for advocacy.

1. An evolving journey: She admitted that as an undergraduate, her goal was simply to get a degree. However, her perspective shifted as she developed a deep interest in women's health issues.

2. Mission-driven specialization: Motivated by the realization that many women lacked education and awareness about their own health, she decided to specialize in studying cervical cancer.
3. Science as advocacy: Her academic path is now a deliberate effort to "help out the female folk." By focusing her advanced studies at Oxford on precision cancer medicine, she has transformed her scientific career into a targeted mission to fight a disease that disproportionately affects women.

Dr. Rosemary Nalwanga sums the discussion up by saying women need to support each other to grow. Women need to work hard at the opportunities given to them and demonstrate their capability. She adds that women need to present themselves and show up where opportunities are, without fear, because for sure, they can do many things well. Dr. Rosemary acknowledges that the support that male counterparts give in workplaces are important.

Part III
Personal narratives and role models in science

In Part III of this book, distinguished females at different stages of their academic and career growth stage share their experiences, lessons and knowledge on the challenges, opportunities, and experiences of females in sciences. Their experiences offer lessons that will be useful in empowering the next generation of females in the science academic and professional growth. The experiences and lessons they share tally with the findings from research presented from leaders in academic and professional bodies in part one as well as the findings of the different research works presented in Part II of this book. Their collective narratives provide a multifaceted view of navigating a career in science, highlighting themes of resilience, the struggle for work-life balance, and the importance of mentorship and purpose-driven work.

16
Not just a man's job: Building a life in biomedical engineering

Nabifo Patricia Manana
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Introduction

This case study presents the personal and professional journey of Nabifo Patricia Manana, a biomedical engineer in Uganda. Her story illustrates resilience, strategic career development, and the persistent challenges of gender bias in a male-dominated field, offering valuable lessons for students of gender and diversity.

From disappointment to redirection

Initially aspiring to be a doctor under the weight of family and societal expectations, Nabifo's path took an unexpected turn when her high school exam results were not sufficient for medical school. Framing this setback not as a failure but as a

"redirection," she pivoted to study biomedical engineering. This decision required significant personal adjustment, as she moved far from home and had to adapt to a new and challenging academic environment.

Professional development and strategic networking

During her university years, Nabifo actively balanced a demanding course load with significant leadership responsibilities, including roles in the MUST SDG Hub and the Rotaract Club. This experience taught her essential lessons in responsibility, empathy, and resilience.

Recognizing the importance of connections, she made a deliberate effort to build a strong professional network by connecting with industry leaders, potential employers, and innovative peers. She also actively participated in extracurricular opportunities like hackathons and fellowships, which sharpened her technical skills, exposed her to global standards of innovation, and expanded her professional circle. These relationships proved vital, offering mentorship, collaboration, and support throughout her career.

Navigating a challenging career path

After graduation, Nabifo faced the reality of job hunting without established connections in Kampala. She volunteered at a hospital to remain active and, after a period of searching, secured a position as a technician with a biomedical company. The role was physically demanding, requiring travel to remote areas and handling heavy equipment—tasks often stereotypically assigned to men. Through her commitment and hard work, she earned a

promotion to Coordinator of Technical Operations within nine months.

A significant turning point came when she was offered a short-term contract at a top research facility, a role more aligned with her long-term ambitions. She made the bold decision to leave her secure, permanent job, a leap of faith that she credits with shaping the next chapter of her professional life.

Confronting societal and gender-based challenges

Nabifo's journey was marked by significant obstacles rooted in societal norms and gender bias:

1. Societal expectations: She constantly had to defend her career choice against the traditional expectation for women in her society to prioritize marriage and family.
2. Gender bias: She faced explicit discrimination. An internship colleague dismissed her, stating she "did not look like an engineer," while a company outright refused to hire her after a successful interview because its leadership preferred male engineers. She used these humiliating experiences to fuel her determination to succeed.

Recommendations for women in STEM

Drawing from her experiences, Nabifo offers powerful advice:

For aspiring women:

1. Be relentless in growth**:** Continuously seek knowledge through reading, courses, and conferences.
2. Build intentional networks: Cultivate relationships with mentors, peers, and industry leaders.

3. Advocate for yourself: Do not wait for permission to take up space. Speak up, ask boldly for opportunities, remembering that "closed mouths don't get fed."

For established women:

Reach back: Mentor, share experiences, and help clear the path for the next generation of women. Supporting others strengthens the entire community.

17
Women in engineering experience

Nayebare Maureen

Introduction

Nayebare Maureen's account offers a detailed and personal case study of a woman's journey through the field of engineering. Her story highlights the importance of adaptability, proactive leadership, and strong mentorship in overcoming significant societal and gender-based challenges, making it an insightful resource for understanding the lived experiences of women in STEM.

Origins and a resilient academic path

Inspired by a love for mathematics instilled by her father, Maureen initially aimed to become an aerospace engineer. When her high school results required a change of plans, she pivoted to electrical and electronics engineering at Mbarara University, viewing it as an alternative route to her ultimate goal. This early experience demonstrates a key theme in her journey: adaptability in the face of setbacks.

From a young age, as the firstborn in a fatherless home, she was trained for leadership. This foundation was strengthened through numerous leadership roles in high school and university, including serving as Vice Guild President—the first person ever to hold the position from the Faculty of Engineering. This leadership trajectory continued into her postgraduate studies at McGill University in Canada.

Innovation and career-defining moments

Beyond academics, Maureen is actively engaged in innovation. She co-founded a company, Smart Kuku Brooder Technologies, with four male colleagues. As the only woman on the team, the experience taught her how to collaborate effectively in a male-dominated environment, pitch ideas confidently, and focus on creating societal impact.

A pivotal moment came when she volunteered to moderate a conference on low-field magnetic resonance imaging (MRI). This single act of initiative opened the door to the world of medical engineering, leading to her participation in building the first low-field MRI scanner in Africa. This experience connected her with key figures in the field, including her future supervisor at McGill University, and launched her into international collaborations and conferences, solidifying her career path.

Navigating systemic and personal challenges

Maureen candidly outlines the multifaceted challenges she faced as a woman in engineering:

1. Stereotypes and malicious rumors**:** She endured the common and damaging accusation that her success and leadership positions were the result of "sleeping with lecturers." Her primary coping mechanism was a strong support system of both male and female mentors who provided guidance and reinforced her self-worth.
2. Physical limitations**:** During an internship at a power plant, she was unable to perform certain physically demanding tasks, leading her to feel inadequate. She countered this by leveraging her strengths, volunteering to chair team meetings where her leadership skills could shine, thereby earning the respect of her colleagues.
3. Unwanted advances: Working in male-dominated spaces, she frequently had to navigate unwanted romantic advances. She handled this by politely but firmly declining, even when it created social friction.
4. Menstrual health: The physical demands of fieldwork were often complicated by her menstrual cycle. She managed this by monitoring her cycle and communicating proactively with her supervisors when she was unwell.
5. Lack of professional trust: She experienced male colleagues re-doing work she had already completed, a clear sign of disrespect and lack of trust in her abilities. Her solution was to advocate for an equal and clear distribution of tasks to ensure accountability and mutual respect.

Conclusion: Paving the way forward

Maureen's journey is one of persistence and the transformative power of mentorship. She concludes that women are not just

capable of succeeding in engineering they are "essential to its future." She embraces her responsibility to open doors for the women who will come after her, hoping her story inspires them to lead powerfully and create boldly in a field where they unequivocally belong.

18
Perseverance

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Introduction

This case study chronicles the life of Victoria Nakabugo, a recent university graduate from Uganda. Her story is a powerful testament to perseverance in the face of relentless financial hardship, social challenges, and a personal crisis, making it an inspiring and instructive text on resilience for students of gender and diversity.

A constant struggle for education

From a very young age, Victoria's desire to study was consistently thwarted by a lack of school fees. This challenge was a source of significant trauma, such as being sent home for dues the day before her Primary Leaving Exams. In her first two years of secondary school, she did not have a proper uniform, which made her feel isolated and "out of place."

Her situation improved when her older sister sponsored her through O-levels at a better school, and later, a timely intervention from her uncle provided a full bursary for her A-levels. This

period was a reprieve from financial anxiety, allowing her to focus on her studies, guided by her head teacher's motto: "There is no permanent situation."

A life-altering personal challenge

During her S.6 vacation, amid the COVID-19 pandemic, Victoria became pregnant. Overwhelmed by fear and the feeling that she had disappointed her family, she initially ran away from home. However, with counseling and crucial support from her mother and relatives, she was given a "second chance" to return to her academic path. She began her university studies while pregnant, navigating a new and difficult reality.

Navigating university against the odds

Campus life brought a return to severe financial struggles. As a young mother from a peasant farming family, she had to cover tuition, rent, and daily expenses. The psychological burden was immense, and at one point, she was removed from an exam hall for non-payment of fees. This humiliating experience made her consider giving up and taking a "dead year."

Inspired by a mentor who advised students to focus on their studies and not carry the "cross" of tuition fees, Victoria resolved to concentrate on her academics. Miraculously, her tuition was eventually paid, allowing her to complete her degree and graduate.

Core message: Never give up

Victoria Nakabugo's journey is a profound lesson in resilience. Her story concludes with a powerful message to young girls: focus on the future, do not be distracted by a desire for

things you cannot afford, and view difficult experiences as life lessons. Quoting Winston Churchill, she emphasizes her core belief: "Never give up, Never give up, Never give up." Her life illustrates that even in seemingly insurmountable obstacles, perseverance can lead to triumph.

19
A student's personal experiences

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Introduction

This case study presents the harrowing and resilient journey of Kisaakye Doreen Kabanda, a young woman whose pursuit of education was nearly derailed by a mysterious illness, profound family betrayal, and social stigma. Her story is a powerful illustration of the intersection of gender, health, and family dynamics, and underscores the critical role of maternal and institutional support in overcoming adversity.

The onset of a life-altering crisis

Doreen's life took a dramatic and difficult turn in her fourth year of secondary school (S.4). After being knocked down in a car accident, she began suffering from chronic headaches and fainting spells that severely impacted her ability to study. Her condition was misunderstood and stigmatized by her peers, who

dismissed it as epilepsy or attention-seeking behavior. Despite her health struggles, she managed to pass her O-level exams.

Family betrayal and a mother's protection

The search for a cure led her family down a dark path, culminating in a visit to a traditionalist in Tanzania. In a devastating turn, it was revealed that Doreen's own father was allegedly using her for ritualistic purposes to gain wealth, which was the root cause of her worsening health. Upon discovering this profound betrayal, her mother made the courageous decision to leave her husband, renting a new house to create a safe environment for her children.

Social rejection and professional setbacks

The illness continued to have severe social and professional consequences. Doreen was ostracized by classmates and later fired from a teaching assistant job due to her employer's fear that her condition would cause her to "harm people's children." This constant rejection took a severe psychological toll, leading her to struggle with self-hatred and suicidal thoughts.

A turning point at university

Despite poor A-level results and continued health struggles, Doreen made the pivotal decision to enroll in a Higher Education Certificate program at Uganda Martyrs University (UMU). This marked a new chapter in her life. While initially feeling isolated and depressed, she eventually found a critical support network. University counselors, student leaders (including the UMUSU president), and a few true friends provided her with the

emotional, spiritual, and practical support she needed to regain her footing, focus on her studies, and manage her health.

Conclusion and key lessons

Doreen's story is a testament to her incredible resilience and the unwavering support of her mother. It highlights the devastating impact of patriarchal betrayal and social stigma on a young woman's life, while simultaneously demonstrating the indispensable role of a nurturing and supportive community in fostering recovery and success. Her journey culminates in a powerful piece of advice for other young women facing adversity: "never to despise themselves when they still can."

20 Personal experiences

Gloria Akwii
Masimbi High School, Wakiso, Kampala, Uganda

Introduction

This case study provides a concise yet powerful account of Gloria Akwii's educational and professional journey. Her story highlights the significant barriers that poverty and inadequate school resources can create for a girl's education, while also demonstrating the value of patience, hard work, and self-reliance in overcoming them.

Navigating educational hurdles

Gloria's academic path was defined by persistent financial hardship. As the daughter of a widow, she went through her entire primary education without school-provided meals. This struggle continued into her first term of secondary school, where church sponsorship covered only her tuition fees.

Her academic performance was also directly impacted by the quality of the institutions she attended. A transfer to a school with a shortage of teachers resulted in a fair performance on her O-level exams. Despite these obstacles, including having to walk long distances to school during her A-levels, she successfully completed her secondary education.

Transition to work and the drive for professionalization

After finishing her A-levels, Gloria entered the teaching profession, starting in primary schools and eventually moving to a secondary school. However, as a non-professional teacher, she faces significant challenges:

1. Low pay: Her lack of formal qualifications means she earns a lower salary.
2. Curriculum difficulty: She finds the secondary school curriculum somewhat complicated to teach without formal training.

In response to these challenges, she has taken a crucial step to advance her career by applying to a university to become a professional, qualified teacher.

Lessons learned and advice

Gloria's experiences have taught her invaluable life lessons, which she offers as advice to others facing similar struggles:

1. Patience and faith: She emphasizes the importance of being patient and trusting in a higher power.
2. Hard work and self-reliance: She has learned the necessity of working hard to earn a living and enduring hardships.
3. Self-esteem: Cultivating self-esteem has been crucial in overcoming her challenges.

Her core message is that a combination of patience, obedience, hard work, self-esteem, and faith can help anyone overcome obstacles and build a bright future.

21
Personal experience

Mandera Shakira Peace
Dufile Seed Secondary School, West Nile, Uganda

This case study, written by a secondary school student, Mandera Shakira Peace, provides a unique blend of historical and societal analysis of women's economic empowerment in Uganda, interwoven with her own lived experiences of opportunity and challenge. It serves as an excellent text for exploring the macro-level progress of women's rights and its micro-level impact on an individual girl's life.

The broader context: Women's economic emancipation in Uganda

Shakira begins by tracing the global and national history of women's rights, from the UN's Commission on the Status of Women to the pivotal moment in 1986 when Uganda's National Resistance Movement (NRM) government began actively promoting women's emancipation. She identifies three key areas where this progress is evident:

1. Education: The emphasis on girl-child education, encapsulated by the slogan "when you educate the girl, you educate

the nation," has been transformative. Girls now have equal, and sometimes greater, enrollment in schools. Critically, the stereotype discouraging girls from studying sciences is fading, leading to more female doctors and engineers.

2. Formal employment: Women are increasingly occupying significant roles in companies and organizations, valued for their skills and often perceived as being less corrupt than their male counterparts. This has led to greater financial independence, breaking the traditional reliance on men.
3. The commercial sector: Women have become a dominant force in small, medium, and large-scale businesses. In her local context, she notes the success of market women (called "Awaras"), who often flourish due to their flexible and informal business skills.

A Personal narrative: Opportunities amidst poverty

Shakira's personal story illustrates the direct impact of these societal shifts, particularly the value placed on girls' education and gender equality at home. She highlights several key opportunities that have shaped her life:

1. Equal educational opportunity: Despite coming from a low-income family, her parents ensured she had the same chance to attend school as her four brothers.
2. A gender-equitable upbringing: Her family environment is peaceful and non-violent. Crucially, household chores and responsibilities are assigned equally to all children, regardless of gender, which has instilled in her a strong sense of self-worth and integrity.

3. Supportive networks: She has benefited from the guidance of good friends, parents, and teachers, which has helped her maintain a positive lifestyle and strong moral values.

Persistent challenges

Despite these positive experiences, Shakira's life is framed by significant challenges rooted in poverty and social pressures:

1. Economic hardship: Her family struggles with inadequate housing (living in a grass-thatched hut without proper lighting), food insecurity (often having only one meal a day), and the looming uncertainty of whether they can afford to fund her dream of becoming a medical doctor.
2. Social pressures: As an intelligent and attractive young woman, she has had to consistently fend off unwanted sexual advances from boys and men. Some have tried to disrupt her education, while others have attempted to exploit her family's poverty with false promises of support.

Shakira concludes that while progress has been made, a girl's ability to succeed is profoundly influenced by her family's economic status and wisdom of her parents. She asserts that parents, especially those in poverty, need support to effectively guide and protect their daughters.

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Personal experience

Kinyaa Jenifer
Homing Dove Primary School, Laropi, West Nile, Uganda

Introduction

Written from the insightful viewpoint of a primary school student, Kinyaa Jenifer, this case study examines the dual nature of Information and Communication Technology (ICT) for girls in her West Nile community. It highlights the promise of digital literacy while exposing the profound gender-based disparities and dangers that accompany the spread of technology.

The gendered digital divide: From past to present

Jenifer begins by noting a historical pattern: while women were initially trusted with early office technology like typewriters, men gained more control as technology evolved. She observes this disparity in her own life and community. Her father owned a mobile phone 15 years before her mother, and even today, most women in her village do not own smartphones. She interprets this as a clear sign that "the girl-child is not prepared to fully fit in the rapidly changing technological world."

Despite this, Jenifer is personally motivated to bridge this gap. She has taught herself to use various smartphone apps, often in secret, and her parents have promised to support her ambition to learn computer skills before she starts secondary school.

The dangers and challenges of technology for girls

Jenifer provides a stark account of the negative consequences she has witnessed, which disproportionately affect adolescent girls:

1. Sexual exploitation: The intense desire among girls to own a smartphone, combined with their limited financial means, makes them vulnerable. Some become victims of transactional sex, leading to the spread of STDs, high rates of school dropout due to early pregnancy, and forced marriages.
2. Erosion of cultural norms: She observes that online relationships often bypass traditional family involvement and background checks, contributing to unstable marriages, family break-ups, and the neglect of children, with girls suffering the most from the fallout.
3. Educational inequality: A significant digital divide exists in education. Girls from poor or rural families attend schools with inadequate technological resources, compromising their education and leaving them at a disadvantage compared to wealthier peers. This vulnerability can lead those who drop out into prostitution or early marriage.
4. Parental restrictions: Jenifer identifies a key paradox. Her own parents, like many others, restrict her access to a smartphone out of fear that it will lead to inappropriate relationships and derail her future. While she understands their

protective instincts, she rightly identifies this restriction as a challenge that limits her ability to develop the very digital skills she needs for the modern world.

Conclusion and recommendation

Jenifer concludes that digitalization is an unstoppable force. While acknowledging the serious challenges, she advocates learning from these experiences to improve digital skills. Her core recommendation is a call to action for parents: to provide equal opportunities to all their children, boys and girls alike, to gain the electronic skills necessary to thrive in the future.

23
My life experiences in primary as a girl

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This final case study offers a simple yet insightful perspective from Eisannu Wema Ochieng, a young primary school girl. Her reflection provides a foundational look at the skills, challenges, and opportunities that shape a girl's early educational journey, emphasizing practical learning and the development of basic problem-solving skills.

A holistic learning experience

Eisannu's account highlights that her education extends far beyond academics. She has learned a wide array of practical life skills, including cleaning, washing clothes, and swimming, alongside taking responsibility for her personal property. Creatively, she has enjoyed making arts and crafts and participating in cultural dances, which she finds very interesting. This demonstrates a well-rounded educational environment that fosters both practical competence and cultural appreciation.

Navigating simple, everyday challenges

The challenges Eisannu describes are relatable and formative for a child of her age:

1. Health: She deals with a skin reaction to certain protein-rich foods like meat and milk.
2. Academic anxiety: She admits to finding it hard to master some lessons and panicking when the teacher asks her questions.
3. Logistical issues: She has experienced the discomfort of running out-of-pocket money and not having her parents' contact information for emergencies.

Importantly, she is already developing coping mechanisms. She has learned that to overcome academic difficulties, she must practice, internalizing the adage "practice makes perfect."

Opportunities for growth

Eisannu recognizes the valuable opportunities her school provides:

1. Social development: She values the chance to meet and make friends with children from different communities and learn about their cultures.
2. Future aspirations: She understands that the opportunity to study is fundamentally important and will "help me to become an important person in the future."

Recommendations from a child's perspective

Her advice is simple, direct, and practical, reflecting the core lessons she has learned:

1. Communicate: If you face challenges, it is important to talk to teachers and parents.
2. Practice: If you don't understand something in class, keep practicing until you do.
3. Be prepared: Always have your parents' contact information available for any emergencies.

Part IV
Further reflections and readings

24

Not just a man's job: Building a life in biomedical engineering

Nabifo Patricia Manana
Makerere University Water Reed Programme

Introduction

My name is Nabifo Patricia Manana, and I hold a Bachelor of Science in Biomedical Engineering. My journey into this field has been anything but straightforward. Growing up, I loved math and science because they made me feel capable and curious. As the first daughter, the weight of expectation was heavy. Everyone around me believed I would become a doctor. For many years, I believed that too.

In high school, I pursued biology, chemistry, and mathematics, aiming for medical school. When my UACE results fell short, I felt devastated. I had failed everyone who supported me. That moment taught me my first real lesson: sometimes a door

closing is not rejection, but redirection. Instead of giving up, I pivoted. I chose to study engineering in Mbarara, which came with its challenges. Moving far from home, adjusting to a different environment, culture, and language was a challenge that tested me daily.

Professional development opportunities

At university, the struggles continued. Balancing a demanding course load with leadership roles was not easy. I served as Assistant Education Minister on the MUST SDG Hub and took on leadership in the Rotaract Club of MUST. Organizing medical camps, blood drives, and outreach projects while handling exams and projects stretched me. Often, I worked late into the night, faced failures, and had to rebuild my ideas from scratch. This taught me that leadership isn't about titles; it's about responsibility, empathy, and resilience.

Beyond skills, I deliberately pushed myself into public spaces to build a network that significantly shaped my career path. I endeavored to connect with influential people, including managers of companies and institutions where I hoped to work in the future. I also built strong professional relationships with peers who shared my passion for innovation and service. Many of these connections became mentors, collaborators, and supporters who have continued to play a vital role in my professional journey.

Innovation became another battlefield. I led and participated in various innovative projects that taught me that setbacks are part of the process. Competing in the CAMTech Hackathon and

seeing our project come out at the top boosted my belief that innovation could drive real change, not just on paper, but in the lives of communities. I also maximized extracurricular opportunities such as UNESCO hackathons, StartHub programs, etc., as well as various fellowships. These opened my eyes to global standards of creativity and collaboration, building a broader network and sharpening my ability to work across cultures.

Graduating brought a new reality. I returned to Kampala without connections or real-world experience. I spent months job hunting as I volunteered at a hospital to stay active. It was not easy to keep believing in myself when doors kept closing. I finally landed my first role with a biomedical company as a technician. I threw myself into the work, determined to prove my value. The job was physically demanding, involving travelling to remote areas and carrying heavy machines, furniture, and spare parts. Yet I stayed committed, earning a promotion after nine months to Coordinator of Technical Operations.

Just as I was settling into my new role, I landed a short-term contract at one of Uganda's top research facilities, something more aligned with my long-term goals. This puts me in quite the conundrum: either stay in a secure permanent job or take a leap of faith. That decision, scary as it was, has shaped the next chapter of my journey and deepened my belief that sometimes the biggest growth comes from the boldest moves.

Challenges

Choosing to pursue engineering as a woman in Uganda often felt like going against the blueprint society had laid out for me.

In many parts of African society, the expectation is clear: finish school, get married, and start a family. Balancing ambition with societal expectations was difficult, and often I had to defend my choices not just professionally but personally too.

Even with hard work, gender bias remained a painful reality. During my first internship, a colleague openly said I did not "look like an engineer" and that I should have become a receptionist instead. The most painful example came during the early days of my job search. After a strong interview, a company refused to hire me because their leadership preferred male engineers. Being dismissed because of my gender felt humiliating, but it fueled my determination to succeed.

Today, I continue to build a career in a field that was not made with people like me in mind. I work to create impact, to open doors, and to show that engineering belongs to everyone who is willing to do the work.

Recommendations

To the young women who aspire to build careers in male-dominated fields, be relentless about your growth. Stay informed, because knowledge creates opportunities. Read widely, attend conferences, take online courses, and follow leaders and organizations shaping your industry. Invest in building strong, intentional networks. I would not be where I am today without the guidance of mentors, the encouragement of peers who shared my ambitions, and the support of people who believed in my potential even before I fully believed in it myself.

Do not wait for permission to take up space. Speak up, advocate for yourself, and ask boldly for what you want. One of my mentors often reminded me, "Closed mouths do not get fed," and I have seen firsthand how true that is. Opportunities often come to those who dare to ask for them.

To the women who have already broken through barriers, reach back. Offer mentorship, share your experiences, and help clear the path for those coming after you. Every voice matters, and lifting others strengthens not just individuals but entire industries and communities.

25
Women in engineering experience

Nayebare Maureen

Introduction

Being a woman in engineering has been one of the most rewarding journeys in my life. It entails a mixture of excitement about doing what most thought was impossible, and anxiety about whether one does it as well as the males do daily. It is a fulfilling yet hard path to take, but at the end of the day, entirely worth it.

How it all started

My journey in engineering all started with my love for mathematics, which my father taught me from the time I was 8. I always knew there was something special about numbers because of how the concepts all came together. Initially, I desired to become an aerospace engineer because I wanted to do what I had never seen any person in my community do. I offered physics, economics, and mathematics during my advanced level in high school, but did not perform well enough to go to an aerospace

university. That was when I decided to join Mbarara University and instead pursue a bachelor's degree in electrical and electronics engineering, after doing thorough research and discovering that this would lead me to my dream, aerospace.

Leadership experience

As the firstborn of five, orphaned at 13, I was trained to lead my sisters and brother, alongside my widowed Mother who trained me to speak for myself, pray always, and work hard as a leader of tomorrow. During my high school days at Maryhill, I took part in many leadership roles like Minister of Education, Maths Club president, Choir Leader, to mention a few. These are the skills that helped me stand out in society, and this built my confidence to even lead at higher levels. I could then lead at the university level as vice guild president, class coordinator of the engineering class, vice president of St. Luke's Chapel, and the Rotary Foundation Director of Rotaract Club of Mbarara University. I was elected as a member of the Invigilator Bargaining Committee at McGill University under the Association of Graduate Students at McGill (AGSEM). In addition to that, I am currently the head of the Multimodal Imaging of Neurodegenerative Diseases (MIND) Lab at the Montreal Neurological Institute at McGill University and an organizer of the Imaging Without Borders (IMAGINE) Summer School, where we shall train master's and PhD students on how to build 50mT low-field MRI scanners.

Innovation

While at Mbarara University, my four friends and I started up a company (Smart Kuku Brooder Technologies Limited) which

makes smart brooders for chicks in poultry farms. We took part in some competitions like the Center of Innovation and Technology Transfer (CITT), National Agricultural Research Organization Uganda (NARO) and Agriculture Youths and Technology

(AYUTE) Challenge. We emerged as winners at some competitions, and this provided us with funds to invest in our company. As the only woman on the team, I built more confidence when I pitched ideas, and my views were heard. It was a fulfilling experience when we installed some brooder systems at poultry farms in the Mbarara district. This innovation taught me how to work in teams with male engineers and learn the most from them. Although we lost some competitions, I gained a stronger understanding of how to pitch ideas, persuade an audience, and emphasize social impact alongside the entrepreneurial value of an innovation.

Engineering work involvement

During the internship period at Mbarara University, I worked with UMEME, where we installed electric poles at people's homes, and later Uganda Electricity Distribution Company Limited (Namanve Thermal Power Plant), where we generated 50MW of power.

Life took a turn for even better when I volunteered to moderate the first SMART Africa Conference on Low-Field Magnetic Resonance Imaging in Sub-Saharan Africa. I attained this opportunity because I was a Vice Guild President then, and as the first ever from the Engineering Faculty, I had the privilege of working with the Faculty Dean, Dr. Johnes Obungoloch, Principal Investigator of the Low-Field Magnetic Resonance Imaging (MRI) lab at Mbarara University. That was when I took part in the

first-ever Low-field MRI scanner build activity in Africa, and this opened the door for many other collaborations, like the Bill and Melinda Gates Foundation through the International Society of Magnetic Resonance in Medicine (ISMRM).

As the only undergraduate African student who attended the ISMRM conference in Toronto in 2023, I went to various MRI talks and learned about the importance of applying engineering in medicine. I was assigned a mentor, Prof. Udunna Anazodo, who is my current supervisor at McGill University. I also submitted an abstract, which I virtually presented at the first ISMRM African Chapter Conference in Ghana. This boosted my confidence to delve more into engineering because I had finally gotten a platform to share my knowledge with the world. I also got a chance to attend the ezyNerd Fest Scanner build in Singapore in May 2024. All these were a result of hard work, consistency, and surrounding myself with brilliant, like-minded people. I currently work at the International Student Services at McGill, an invigilator at McGill University. I attribute all these achievements to God, strong mentorship from my mother, mentors, and supervisor.

Challenges

This might seem a smooth journey, but it is certainly not. As a woman in engineering and a leader, I have faced the challenge of being blamed for sleeping with lecturers for positions of power and grades. This is the commonest challenge among my female engineering circles, brought about by society stereotypes that women cannot lead, let alone do engineering work like programming, writing abstracts, and designing systems like scanners. This was a demotivating factor, but the best way I managed it was

through mentorship, where I met up with Prof. Udunna biweekly and shared these challenges with her. She always reminded me I had potential and taught me how to ignore background noise. Dr. Theodora Twongirwe is another woman engineer who gave me some self-help books that taught me how to keep toiling towards greater heights without looking back. My mother is one strong pillar who never condemned me, even when a lot was said against me. She had trusted me, and that kept me on my toes. Mentorship has been my strongest pillar, and keeping male mentors in my life also helped me learn from both genders on how to excel as an engineer. Engineer Ian Bakiza, Dr. Johnes Obungoloch, Prof. Nixon Kamukama, Mr. Kwatampora Vincent, and Paul Veillard are among the male mentors who have guided and supported my development as a leader in engineering.

The second challenge involved difficulty completing certain tasks because of physical limitations. This was a big challenge while I trained at Namanve Thermal Power Plant. I was unable to carry certain engine parts, and I was sometimes assigned lighter roles, which wasn't entirely impressive but was considerate of the company. This made me feel like I was not enough, and I dealt with this by volunteering to always chair the early morning daily team meetings, where I felt my strength lay. This earned me respect because the engineering community recognized my leadership skills. The third challenge is working in male-dominated fields where most males actually asked me out. I always said no, but it was never fun having enemies in class and at work because I did not accept dating them. I managed this by always politely declining date offers from most men in engineering who asked me out. Another challenge is a change

in mood because of a change in the menstrual cycle. I am naturally an energetic woman, but sometimes, I wake up unwilling to do any sort of work because of a change in my cycle. This usually affected my performance at work and even at school. In some cases, menstrual cramps did not let me do certain tasks while on site, especially at UMEME, where we dug holes to plant electric poles under the sun, in districts like Ntungamo, Ibanda, Mbarara, and Bushenyi. Sometimes, we worked in three districts in one day.

I always experienced uncomfortable feelings, especially with transportation, where we used vans and traveled alongside our equipment. As a solution to this, I always monitored my cycle and tried out a few fun events to boost my morale. And for days we had to work under the sun, and I did not feel fine, I communicated to the supervisor early enough, so he pardoned me.

Lastly, a major challenge I have faced as a woman in engineering research is being placed on teams with male counterparts, where I have done certain tasks and some male engineers redid the work I did. This always made me feel un-appreciated and not enough. I solved this by always distributing tasks equally so that each of us did their part and respected what his team members did.

Conclusion

My journey as a woman in engineering has been anything but ordinary. It has been shaped by persistence through challenges, strengthened by the support of my mentors, and driven by a strong conviction that I belong in this space. Being awarded as the best female electrical engineering student by the Engineers

Registration Board gave me courage that my country believed in me, and that led me to believe in myself even more. Engineering is not only about equations and physics laws, but about impact, innovation, and building a better world. There is enough room at the table for women to lead in that mission. Looking forward, I carry with me lessons of resilience and a responsibility to open doors for those after me. I hope that more young women will see engineering not as a path reserved for a few but as a canvas, where they too can create boldly, solve meaningfully, and lead powerfully. Because we don't just belong in engineering, we are essential to its future!

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Perseverance

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My name is Nakabugo Victoria, a fresh graduate from Kyambogo University, aged 25. Growing up as a girl has presented its share of both challenges and triumphs, yet looking back, my journey has been defined by kindness and divine mercy. I have always loved studying, but school fees were a constant shadow over my education I vividly remember the eve of my Primary Leaving Examinations (PLE) in Primary Seven. I was sent home to collect school dues just as I was supposed to be sitting for my final papers. It was a traumatizing experience; instead of revising, I was filled with the anxiety of being left behind. Despite the stress, I managed to score 13 aggregates, passing in the second grade.I joined S.1 at St. Francis Borgia High School Mukono (SFB), but raising school fees was still a struggle. I was frequently sent home, and even when I managed to return, it was often long after the term had started.

For the first two years, I didn't even have a school uniform. Walking around campus without one made me feel small and out of place, as if I didn't truly belong.

Fortunately, my older sister stepped in. She asked my mother to let her take over my education, and she moved me to St. Joseph's High School Namagunga for Senior Two through Senior Four. For the first time, I felt a surge of pure happiness; I finally had a complete uniform and could attend class without the constant fear of being sent away.

After the exam results, I needed to proceed to "A" level. Unfortunately, the cycle of poverty returned. My sister told me I would have to skip Senior Five because she simply could not afford the fees. With no other options, I knelt and surrendered my future to God. Miraculously, my uncle called my sister shortly after and arranged for me to join St. Mary's College Lugazi on a full bursary. They even gave me a free uniform. Throughout my "A" levels, my only struggle was my books, not the fees. When it came to visitation days, my goodness! Sometimes my mother would visit without bringing anything, though I was proud whenever she showed up. Students were often visited by people arriving in cars and bringing them plenty of snacks and treats, but for me, on those days when I had nothing, I would just sleep, content with the fact that I came from a humble background. The meals at school, particularly during my A-Level, were generally good. On weekends, we had buns for breakfast and sometimes milk, with each student receiving an egg despite the large numbers. For lunch, we typically ate rice with fish in groundnut sauce or porridge (katogo) on weekends. On Wednesdays, we usually had rice with beef or rice with fish in groundnut sauce.

We often had visiting days when ice cream, fried chicken, and many other treats were brought to school and sold. There were

so many of us that when a parent came to visit, our names had to be announced from the DJ's desk. We used to also hold "K mos," known as kirommo, with lots of edibles sold at the school canteens, like deep-fried chicken, sausages, sumbiz, ice cream, cakes, scuits, eggrolls, spats, and many more. We also used to have term X for candidates specifically, and this was indeed hectic, more so for us who would just wait for school meals. Oh God! The most exciting moment was when we used to have talent shows. During these sessions, kids would perform; musicians were brought in to entertain us. I have fond memories of Vienna, John Black, and the B2C Boys coming in one after another—it was always an enjoyable experience. During our time at SMACOL, Crysti Panda was usually brought in for prom parties. However, in 2019, during my S-6, he was not invited. Only Phille a female musician, was brought in to perfume her hit, "Squeeze of the Time." Prom was also fun, but what I remember most about SMACOL was the strict order: girls on one side and boys on the other.

Dances were never allowed at St. Mary's College Lugazi. However, assemblies were fantastic and fun: student leaders performed their duties, the news was read, and we had the Smacolian Blaze, which shared stories from within the campus, spearheaded by our speaker of the school whose English was fluent. The only other thing I cannot hesitate to talk about is PREPS. The morning and evening preps were kangaras!! I remember the early morning preps during the History 1 lessons when most of us would doze off because we used to over-read during extensions, which were a must for all candidates. Our head teacher, Mr. Ofwono, often reminded us that "there is no permanent situation." Through

perseverance and hard work, his words proved true, and we completed high school with good grades.

However, during my Senior Six vacation, life took an unexpected turn. At 19, I became pregnant. I was terrified and had no idea how to handle the situation. Fearing I would be a massive disappointment to my parents, I ran away from home. But through the grace of God and the counseling of my mother and relatives, I was welcomed back. My parents chose to give me a second chance. It was incredibly difficult—I returned to my studies while pregnant, and by the end of the second COVID-19 lockdown, my baby was already six months old.

Campus life was also difficult. I had to pay for food, hangouts, data, clothes, and even rent, yet my tuition was already a heavy burden on my peasant parents, who were farmers. Even so,

. I often thought about Dr. Nankindu Prosperous's words: "A student's job is to study, not to worry about tuition." He warned us that if we focused too much on the "how" of the money, we would fail our exams. I tried to focus, but the fear was constant.

God was merciful to me because, in my first semester, I was able to sit for all my papers without paying a single penny. To make a long story short, I even thought about taking a dead year, though the process was long and complicated. At one point, I was taken out of the examination room and had to sit for the paper again as a retake. This frustrated me deeply, and I almost lost patience because I felt I would never sit my exams in peace. Reading also became difficult, as I feared studying in vain and missing my papers. But God was on my side. Tuition was eventually raised, which eased my stay at the University. I graduated on the 11th

of Dec. 2024. In a nutshell, I encourage young girls to look up to the future and stop yearning for what they can't afford. Quoting Sir Winston Churchill's words, "Never give in—never, never, never, never—except to convictions of honour and good sense." Tough times come and go. No situation is permanent, Treat every experience as a life lesson . Learn from them.

27

Career growth for females in sciences: Experiences, opportunities and challenges

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I am a female aged 21years. I live with my mum and my siblings at Kasijjagirwa, Masaka. I studied my nursery section at Babiito Primary School, Bukomansimbi and my primary section at Kisosso Parents Primary School, Masaka. I joined Masaka Secondary School for my O and A levels. I grew up with both my parents, though they broke up. I went through a lot in order to reach this level. I started experiencing what life means when I joined Secondary. I used to live at Gayaaza, Masaka where Dad's home is. Although we lived with our Dad, he never wanted to pay school fees for us. Mum was the one struggling for us to

study. She used to work at Kisosso Parents Primary School, Main campus, as a secretary, and she was transferred to Kasijjagirwa Campus as a Bursar. She used to be a farmer, and that's where she earned the money for our well-being.

Challenges

I was a normal, healthy and intelligent student from my Senior to Senior 3 but all this changed in my Senior 4 when I was knocked by a car. The accident led to persistant headaches that made it hard for me to concentrate in my studies. I couldn't spend a day without fainting and people started saying that I was suffering from epilepsy. Despite my poor health, I loved to study so I joined A level at Masaka Senior Secondary School however, because of frequent fainting and poor health, some of my classmates neglected me thinking I was just pretending. My parents and I tried prayers and we even visited traditional healers, but nothing changed. The COVID 19 pandemic broke out and schools were closed, we had to stay home for a year. In this period I started receiving medicine for mental illness at Masaka Referral Hospital. When COVID 19 lockdown was lifted, I went back to school, studied and sat for my Senior six examinations however, when the results came out, I had poorly. Aulthough by this time I had got a job and was teaching in a primary school and the children and their parents love me, my co-workers didnt like me. The later feared that I would harm the children due to my poor health and so I was fired from the job.

One day I went to get my results slip from my former secondary school and while there, the deputy headmistress advised me not to drop ut but continue with my studies. I took her advise and

applied to undertake Higher Education Certificate Course from Uganda Martyrs University, Nkozi Campus. I was admited for the course and when I joined, I was able to access and benefit from the services of the university counselor. The university counselor was polite and welcoming. Her behavior made me feel at home at the university even though making friends among my fellow students was not easy for me. Many of my fellow students could not associate with me due to my poor health. One of my former classmates in secondary school was also at the university, in second year pursuing a degree in law. He new about my health conditions so he was always supportive when I needed. However, I often felted depressed seeing my clasmate already in the second year of his degree study while I was still pursing a certificate to enable me enrol for a university degree course.

Opportunities

I once felt like quitting my studies, but the president of the university student union and the university counselor helped me to get back on track. I also have a loyal friend, Gorreth. I also learned some hard lessons when the people I thought were my friends told me I was a problem to them. I fell sick because of what happened, and my friend Richard helped me through it. The university student union president gave me advise that helped to stop worying about what other students would say about my health and instead focused on my own life and studies. The university's Anglican Church Community also helped me to reconnect with God. My friends Gorreth and Kisakye encouraged me to read harder. I continued taking medicine and my health improved. I began to feel healthier and truly blessed.

Conclusion: Educate a female child for a better future

Recommendation (Advice): I encourage my fellow young women never to look down on themselves while they still have the chance to rise. If I had given up on myself—and if Mum had given up on me—where would I be today.

Acknowledgement

I thank GOD for the gift of life, and for my mum, my grandfather, my aunt, and my siblings, who have always stood by my side. You really loved me without hesitation. May my Redeemer grant you whatever you wish for in this life. For my heroine, as you are a single mother, may He bless the work of your hands and also grant you the happiest life. Thank you for never letting us down as you have sweated day and night to provide everything for us. May the Lord also bless my stepfather, who has never left my side. Thank you for giving us the courage to study and work hard for our future. I have not forgotten the directors of Kisosso Parents Schools. May the Lord bless you as you have been there for Mum and us in every situation. Thanks to the university staff who have been there for me. I humbly thank the union president, my OB and my friends Stella, Beatrice, Gorreth, Richard, Jonathan, and my tablemates, who have never left me out. May the Lord keep blessing you, my brothers and sisters.

28

Experiences, challenges and opportunities from primary school to work

Gloria Akwii
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My name is Akwii Gloria. I started schooling at Mulanda p/s and the challenge I faced was studying without meals (lunch) throughout that level because my mother was a widow and she couldn't afford to pay. Despite the challenges I faced, I managed to pass PLE very well with 19 aggregates. The following year, I first joined S.1 at Tororo Parents Girls' School. I again studied without meals because the church was paying for me only school fees as an orphan. From there I was taken to Rubongi s s s in S.1 second term and I studied without any disturbance because my tuition was always paid on time. On the contrary, the school lacked enough teachers, and this made me perform UCE fairly well with

50 aggregates and finally, after my O. Level. I joined Rock High School, Tororo, and studied very well. The only challenge I faced was walking the long distance to and from because I wasn't in hostel. Lastly, I sat UACE and scored 12 points.

After S.6, I started teaching in primary schools and after some time I am now teaching in a secondary school. However, as someone who is not a professional teacher, I encounter the challenge of receiving a lower salary. I also find the curriculum a little complicated. However, I have now applied to the university to study and become a professional teacher. This will help me qualify as a teacher. I learnt that it is very good to be patient and wait upon the Lord. I learnt how to work hard and earn a living. I learnt to have self-esteem and to endure hardships. I learnt to pray to God to overcome challenges. So, it is my advice to others to always be patient, obedient, work hard, have self-esteem and pray to God to make their future bright and help them overcome challenges.

My name is Akwii Gloria. I began my schooling at Mulanda Primary School, where the biggest challenge I faced was studying without lunch because my mother, a widow, could not afford to provide meals. Even with these hardships, I passed my PLE very well with 19 aggregates.

In Senior One, I first joined Tororo Parents Girls' School. Again, I studied without meals because the church, which supported me as an orphan, only paid my school fees. Later that same year, I was taken to Rubongi S.S.S. for the second term. There, I studied peacefully because my tuition was always paid on time. However, the school had too few teachers, and this affected my performance. I completed my UCE with 50 aggregates.

After my O-Level, I joined Rock High School in Tororo for A-Level. I studied well, but the long distance I had to walk every day was another challenge since I was not in the hostel. Even so, I sat for UACE and scored 12 points.

After S.6, I began teaching in primary schools, and with time, I moved to a secondary school. However, as someone who is not yet a professional teacher, I face challenges such as earning a lower salary and finding the curriculum a bit complicated. I have now applied to the university so that I can train as a professional teacher and become fully qualified.

Through these experiences, I have learned the importance of patience and trust in the Lord. I learned to work hard, to earn a living, to have self-esteem, to endure hardship, and to pray to God for strength. My advice to others is to be patient, obedient, hardworking, confident, and prayerful so that they can have a bright future and overcome the challenges they face.

29
Women in the context of economic prosperity

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Dufile Seed Secondary School, West Nile, Uganda

The Commission on the Status of Women (CSW) was founded and initiated in 1947, soon after the initiation of the United Nations (UN). After its inception, the commission put much emphasis on establishing standards, by engaging women in international conventions, to raise awareness of women's affairs; a struggle that has globally shaped the co-existence of men and women in different economic activities. History has revealed that before the declaration by UN, countries such as New Zealand had started putting value on women in 1893, and the same was true in Australia in 1902. Accordingly, an international conference in Mexico City in 1975, marked the International Women's Year, a period in memory that sent shock waves to the spines of men who persistently discriminated and treated women as domestic tools.

Although March 8 was set to be International Women's Day in 1913, most countries were defiant until 1975 when the United

Nations declared it a public holiday. However, most developing countries, like Uganda, did not take it seriously from the beginning. In Uganda, women's emancipation was brought to the spotlight in 1986, when the National Resistance Movement (NRM) took power. It was from here that women were strongly encouraged to actively participate in every economic endeavor, including what was traditionally, culturally and psychologically mistaken to be the duty of men. From this background, I was able to experience the emphasis put forth globally to engage women in shaping the struggle to improve the domestic, national and international economic prosperity.

In the first place, the emphasis placed on up-scaling the girl-child education has greatly shaped the economy of Uganda. Girls now take equal chances with boys at all levels of education. With the slogan, "When you educate the girl, you educate the nation," most parents have realized the value of sending the girl-child to school alongside the boy-child. Experience has shown that in other schools, more girls are enrolled than boys. Besides, the traditional stereotype of discouraging girls from studying science subjects in schools is fading. Girls now compete favorably with boys in the sciences, resulting in more women graduating as doctors and engineers. I have also witnessed on most occasions that girls have more chances of getting scholarships than boys. Perhaps it could be the factor that has encouraged more girls to remain and complete education.

Most importantly, women have enormously endowed the formal employment industry. There are various organizations, companies and offices manned by women. In most advertisements, women are always encouraged to apply. Here, they are

known for playing a pivotal role, even better than men, and most of them are not corrupt. As such, their contribution to domestic, national and international economy becomes real. They no longer depend on men for financial support. It is no longer the tradition to employ women as office attendants and secretaries. It is only those who have attained a low education or are uneducated who are employed as housemaids. The wide-open door that has allowed more women into the employment industry has shaped the economy greatly.

Not only that, but women have also taken up, if not all, a bigger percentage in the commercial sector. Clearly women engage in small, medium and large-scale business enterprises. There are even some of them who own large companies, commercial buildings and real estate. In most rural and urban markets, most commercial activities such as sales of produce and vegetables are largely carried out by women. In my area, they are called "*Awaras,*" literally translated as a woman who buys and sells food items within the same market. They are flourishing more than men because of the flexible business skills learned mostly informally. This reality has enabled women to become economically relevant and bailed out of economic hardship.

In my life, I have enjoyed some opportunities. Most of which is to enroll in school alongside my four brothers and the only sister. I started at the pre-primary level and enjoyed equal chances with my siblings. Although I am from a low-income family, I have been able to study at a private school, where the services are better compared to those in public schools. Sometimes, meeting the school requirements may pose some challenges, but the good relationship of my parents with the school management

made me stay in school without being sent home for not paying school dues. These opportunities made me feel respected and therefore hopeful to pursue my future dreams.

Besides, I have also enjoyed the company of good friends, both in and outside school. From the advice of my parents and teachers, I have been able to identify and associate with good peer company; friends who advise and lead me through a positive lifestyle. These are colleagues who give me educational support, enabling me to move on with my education with little difficulty. Such a lifestyle among positive people has made me withstand negative influences, and as such, has improved my morals and ethical values. This has made some people admire my lifestyle, prompting others to wish I were their daughter.

Another unforgettable opportunity in my life is enjoying a peaceful family environment. My parents are the sort of people who treat their children equally and fairly regardless of gender. We are assigned duties and responsibilities equally and randomly. We have been encouraged to carry out tasks such as cooking, washing dishes, grazing animals, and garden work, among others, without labeling some activities to be only for boys or girls. Such training has made me feel great and equally valued. I am assured of growing up a woman of high integrity. Besides, I also enjoy a family environment free of violence. My parents have been so responsible that I have never witnessed any violent altercations or fights between them or with a neighbor. I think this peaceful environment has shaped and will shape my life and equally become responsible.

Despite the above opportunities, there are also some challenges I have faced. The first one has been the inability to access some

basic needs. I have never slept in a modern house with comfortable or well-furnished interiors. We shared one bed with my sister and my cousin in a grass-thatched hut. Because the room didn't have enough lighting, I often found it difficult to enjoy night preps. Second, food is a big problem in our home, to the extent that we only have a meal a day and the diet is not well-balanced. Last, my parents' economic situation makes it uncertain whether I will achieve my dream of graduating with a degree in medicine. Because they have many dependents to support, I may have to settle for a lower-level college certificate instead.

I have also faced social pressures along the way. As a girl who is both beautiful and academically gifted, some boys and men tried to lure me into sexual relationships. Some wanted to distract me from my studies, while others took advantage of the poverty at home and made empty promises of support. With the constant guidance of my teachers, church leaders, parents, and friends, I could resist all these attempts and stay focused on my education.

In conclusion, life is not a smooth journey. Because resources are not distributed equally, the level of poverty in a home greatly influences a family's way of life and, in turn, shapes the experiences of its children. In many cases, the girl-child becomes a victim of these circumstances if the parents are not careful or well-guided. There is a real need for many parents to receive support and guidance on how to protect and empower the girl child.

30
The girl-child in the era of digitalization

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Information and communication technology (ICT) refers to the use of electronic structures and components for improving the creation, processing and sharing of data and information among people. It started in Uganda far back during the colonial period. Thirty-five years after independence, it was only seen in public offices where telephony and typesetting were used. By then, women were mainly trusted and employed to manage the secretariat services and therefore used the typesetters. As the technology started evolving gradually, men started getting fully involved to the extent of opening up computer service centers and internet cafes, which were mainly managed by women.

I was born in 2012, at a time when people mainly used mobile phones for communication. I was told that when phones first became popular; they were owned mostly by men who were financially stable. Even in our family, my father was the first to use a basic button phone, and and my mother only got hers about 15 years later. As phone models and versions continued to

evolve and smartphones became common, I noticed that many women in my village still did not have access to them. To me, this shows that the girl child is not yet fully prepared to fit into our rapidly changing technological world.

Right now, I have learnt how to use both button phones and smartphones, although mostly when my parents are not watching. I can manage some of the software such as WhatsApp, Tiktok, games, and Gmail, although I don't own a phone. This experience has made me eager to learn more and gain basic computer skills before I join secondary education in 2026. My parents have promised to buy me a laptop and to engage a specialist to train me. This motivation has made me proud of my parents, giving me hope of pursuing my dream of becoming a woman of value in the science-dominated field.

Despite the opportunities and experiences, I have gained; I have also witnessed many challenges related to the use of technological gadgets One of the most troubling issues is that many adolescent girls, both in and out of school, feel a strong desire to own a smartphone, yet most have very limited financial means. Because of this, some have become victims of sexual exploitation (sex for material gain) by men who have the money. This practice has become a major factor responsible for the spread of sexually transmitted diseases and infections (STDs and STIs), high rates of school dropouts because of early marriages and pregnancies. In addition, the use of various technological platforms has greatly contributed to the decay of important cultural practices. Ladies rarely introduce their fiancé anymore to their parents for adequate background checks. Everything is done online. This has become a major factor in family break-ups, resulting in

serious negligence and abuse of children's rights, a situation the girl-child suffers the most.

Furthermore, there is a serious imbalance in how technology is used for educational purposes. Girls from rural areas, as well as those from urban areas with poor financial backgrounds, were more disadvantaged compared to their counterparts from wealthier families. Because of the severe poverty levels in my area, most parents send their children to rural secondary schools that are not well equipped with technological gadgets. The result is that educational standards are compromised. Being the most vulnerable gender, many girls who dropped out of school ended up in early marriages or engaged in prostitution. Last, I have not been given the chance to explore or use a smartphone openly to gain more skills. My parents often restricted their daughters from using phones because they attributed the practice to easily getting involved in girl-boy sexual relationships, which has been a major cause of school dropouts in our community. For this reason, I am only allowed to use a phone to call a known person while my parents are present. I consider this a challenge because it limits my ability to deepen my understanding of technology.

In conclusion, digitalization is replacing many practices that were once done manually. I am grateful for the policies that encourage women to take part in managing different activities through digital means. Despite the challenges, which are a natural part of life, we should learn from our experiences and stay motivated to strengthen our digital skills. I therefore encourage parents to give all their children equal opportunities to acquire electronic and technological skills.

31
My life experiences in primary as a girl

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As a girl in primary school, I have learned many useful skills. I have learned how to write well, how to mop, sweep, wash clothes, and even how to swim. I have also learned how to take responsibility for my own property.

I have faced some challenges too. Sometimes I react badly to certain proteins like meat and milk, and my skin gets affected. In class, I sometimes find it hard to understand certain lessons, and when the teacher asks for work, I panic. But I have learned that practicing the assignments the teacher gives really helps us, because practice makes perfect. There are also moments when I run out of pocket money and feel hungry, but I do not have my parents' contacts to call them.

I have also gained new experiences, like making art and crafts such as bags and mats with my hands. At first, I thought it would be impossible for me to learn, but eventually I did. I have also

enjoyed dancing. In class, we sometimes learn cultural dances from different tribes, and I find them very interesting.

Last, I get the opportunity to meet pupils from different communities and make friends with them. I learn about their cultures, and I get the chance to study, which I believe will help me become an important person in the future.

Recommendation

If you have any challenges at school, try to communicate to the teacher and parents. And if you like you do not understand what the teacher teaches you, try to practice the number because practice makes perfect. And if possible, always have your parents contacts for any emergency like in case you have no books, pens, pencils or anything you would like.

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Reading assignments

Part I Reflection questions

1. Professor Edrin Patrick Kyamanywa in Chapter 1 of this book, wrote from the perspective of a "trainer" or educator. How does his viewpoint change the way the challenges and solutions are presented, when you compare it with the chapters written from the perspective of the students or a the working scientists?
2. If you were the president or vice chancellor of a university and had the resources to implement only one strategy from "The Trainer's Toolkit," which would you choose and why?
3. The Professor argues that "gender-neutral" policies often fail to create real equity. What does this mean? Can you think of an example where a policy that seems fair on the surface might actually disadvantage one group?

Chapters 1 to 4 concludes give us the perspectives on women in science and education from the trainers and career women scientist'own experience. Thinking back on all the stories and data you have read, what do you believe is the single most powerful force for creating positive change for women in these fields? Is it government policy, institutional reform, mentorship, or something else? Explain

Part II Reflection questions

1. In Chapter 5, Higenyi and Wanyaka 's work describes a conflict between professional demands and cultural expectations. How do these two forces (systemic barriers and cultural norms) reinforce each other to create the "dual burden?"
2. Even if you do not live in Uganda, have you observed similar pressures on women in demanding careers in your own community? What are the similarities and differences?
3. In the chapter, of the five main recommendations proposed (policy reform, institutional change, cultural shifts, support networks, and mental health), which two do you believe would be the most impactful in the short term? Why?
4. The study highlights the importance of peer support networks. Why do you think sharing experiences with colleagues who face similar struggles is such a powerful coping strategy?

In Chapter 6, Tsigereda and her colleaques' study

1. Reveals a major difference between what students reported (not missing school for chores) and what head teachers observed. What might explain this discrepancy? Why might students be hesitant to admit they miss school for work?
2. The tradition of dowry creates a direct financial incentive for early marriage. If you were a local leader, how would you argue against this from an economic perspective? What long-term economic benefits of educating girls could you highlight?
3. The study suggests that while leaders are active, their impact is not always felt by everyone in the community. What practical steps could a local leader take to ensure their message is reaching the most isolated or traditional families?

4. The authors emphasizes the power of local leaders. Why do you think a message delivered by a respected community elder might be more effective than a message from a national government official or a foreign NGO?

In Chapter 7, Nakabuye Juliet Musoke's study

1. Mentions the "Rosie the Riveter" effect, where a crisis (World War II) created new opportunities for women. How might the development of a new industry, like oil in Uganda, create a similar moment of opportunity?
2. The chapter highlights both top-down government policies and bottom-up advocacy groups. Which do you think is more effective at creating real, on-the-ground change for a woman trying to build a career in this sector? Why?
3. Imagine you are a young Ugandan woman with a degree in geology. Based on the chapter, what would be the biggest challenge you anticipate facing, and what would be your biggest source of hope or opportunity?
4. Local content policies require that a certain percentage of business goes to local entrepreneurs. How does this type of policy specifically help to empower women, who might otherwise be excluded from large-scale international contracts?

In Chapter 8, Robinah Jassa Prudence

1. Uses several powerful analogies (e.g., "the only woman in a room full of men," "juggling a million balls"). Why is this kind of informal, relatable language sometimes more effective at making a point than dry statistics?
2. She asks, "Can't we be scientists and still wear heels and lipstick?" What is the deeper meaning behind this

question? What stereotypes about women in science is she challenging?

3. She discribes her two role models, Dr. Kalema-Zikusoka and Dr. Kazibwe, as women who had strong passion for their work from a young age. How important is early encouragement from family and teachers in nurturing that passion?
4. What is the single most important lesson you will take away from this chapter ?

In Chapter 9, Professor Maurine Maraka Wafula's work

1. Describes a "leaky pipeline" where women leave STEM at various points. At what stage (e.g., early education, university, mid-career) do you think the "leaks" are the most significant, and why?
2. The text mentions both formal policies (like Vision 2030) and informal support (like mentorship). In your opinion, which is more powerful for creating day-to-day change for an individual scientist? Why?
3. Role models like Wangari Maathai are cited as being incredibly important. What is it about seeing someone who looks like you succeeding that is so powerful, especially in a challenging field?
4. If you were tasked with designing a new initiative to support young women entering STEM in Kenya, what would be its single most important feature?

Dr. Rajana Rayaradi in Chapter 10

1. Describes a "double bind" where women face both professional and domestic pressures. In what ways can this double pressure affect not just a woman's career path, but also her personal well-being?

2. The text highlights government policies (like the WOS scheme) and community networks (like the IWSA) as key opportunities. Which do you think is more powerful for creating lasting change, a top-down policy or a bottom-up community network? Why?
3. The story of one successful woman, like Dr. R. S. Soni, is mentioned as a source of inspiration. Why is a single, visible success story often more motivating than statistics about general improvement?
4. If you were advising the Indian government, what would be the single most important investment you would recommend to keep women in the "physics pipeline?" Explain your choice.

In Chapter 11, Nisha's work

1. Describes a "leaky pipeline." Based on your own observations or experiences, where do you think the biggest "leak" occurs for women on the path to a scientific career? Why?
2. Of all the strategies for empowerment mentioned (e.g., mentorship, policy change, early education), which one do you believe has the most immediate and powerful impact? Justify your answer.
3. The chapter features several case studies of famous women scientists. Why is it so important not only to have role models but to also make their stories widely known?
4. The author argues that empowering women in science is a "strategic necessity" for sustainability. In your own words, explain what this means. What is lost when half of the population is underrepresented in solving our biggest problems?

In Chapter 12, Salon

1. Highlights several "invisible pioneers" like Lise Meitner and Chien-Shiung Wu. What is the long-term impact on a scientific field when foundational contributions are consistently mis-attributed or ignored?
2. Think about your own early education. Did you ever encounter the stereotype that boys are "better" at math or science? How do you think this stereotype affects the confidence of young students?
3. Of the solutions proposed in the "Toolkit for Change," which one do you believe would be the most difficult to implement, and why?
4. Saloni argues that diversity leads to more innovative and impactful science. Why do you think a team with diverse perspectives and life experiences might be better at solving complex problems than a homogenous one?

Silas Ng'habi in Chapter 13

1. Presents case studies of women who have become leaders (like Dr. Ndalichako) and advocates (like Dr. Ngumbi). In your opinion, which role has a greater impact on creating change for the next generation: the policymaker working from within the system, or the advocate raising awareness from the outside?
2. He identifies a "funding gap" as a major challenge. Why might funding agencies, even unintentionally, be biased toward male-led projects? What steps could be taken to make the grant application process more equitable?
3. His work highlights Rwanda's National Science Policy as a model for the region. What do you think makes a policy successful, it is written, how it is enforced, or the cultural willingness to accept it?

4. After reading this chapter, what do you believe is the single biggest barrier holding women back in science and education in East Africa? Is it cultural, institutional, or economic? Explain your reasoning.

In Chapter 14, the author, Daisy Nabangi

1. Begins her story by talking about her mother. How does having a close, personal role model like a parent influence a young person's career aspirations, especially in a field where their gender is underrepresented?
2. She mentions that the STEM and farming clubs at her school were important to her. What specific things can schools do at the club level to make science feel more inclusive and exciting for female students?
3. She is very direct when talking about challenges like stereotypes and corruption. Why is it important to hear these unfiltered perspectives directly from students? What do we learn from her voice that we might not learn from a formal research paper?
4. Her final line is, "It takes a whole village to raise a child." Based on her recommendations, who are the key people or institutions in that "village?" Who holds the most responsibility for creating change?

Reflection questions for parts III and IV

Read Chapters 16 to 31 of this book and in not more than one thousand words

1. Give your own perspectives on the matters about females in sciences presented and summarize what you found unique and what you found common in experiences shared.

2. Make suggestions of what else you think this book should have included on the subject of focus.

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