

Gender Equity and University-to-Work Transitions: Exploring Barriers and Enablers for Female Science Students at the Catholic University of Rwanda

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Abstract: Despite Rwanda's progress toward gender equity in education, female underrepresentation in science disciplines remains a concern. This study explores barriers and enablers influencing University-to-work transitions for female science students at the Catholic University of Rwanda (CUR). Using a mixed-methods approach, surveys, focus group discussions, and interviews with students, alumni, faculty, and employers, this research provides quantitative and qualitative insights. Findings reveal that 60% of CUR's science students are female, with over 90% securing employment post-graduation, mainly in healthcare and education. Key enablers include academic support (82%), mentorship (74%), and financial sponsorships (68%). However, significant barriers persist: low self-esteem (56%), family-imposed gender norms (49%), and institutional biases (41%). Additional challenges include societal expectations (62%) and limited female role models in science careers (45%). Notably, CUR's proactive gender equity initiatives have helped mitigate many of these constraints. The study concludes that the CUR model offers a replicable framework for improving female participation and transition into science careers. Policy recommendations include scaling holistic support systems, embedding inclusive and gender-responsive curricula, expanding mentorship networks, and conducting community sensitization to address socio-cultural obstacles and ensure sustainable gender equity in science education and employment.

Keywords: Gender Equity, Science Education, University-to-Work Transition, Female Representation, Mentorship, Socio-Cultural Barriers.

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1. Introduction

The persistent underrepresentation of women in science disciplines, despite global strides in gender equity, presents a complex, multidimensional challenge, particularly in Sub-Saharan Africa. In Rwanda, a nation internationally acclaimed for its political commitment to gender equality, educational systems still reflect entrenched socio-cultural biases that impede women's full participation in science, technology, engineering, and mathematics (STEM) fields (Eagly & Wood, 2012; Ridgeway, 2009; Unterhalter, 2013; Cheryan et al., 2015; Nzabonimpa, 2021). This study investigates these dynamics at the Catholic University of Rwanda (CUR), focusing on female science students' transitions from academia to the labor market. Although female enrollment in science at CUR is encouraging (60%), significant barriers—ranging from family-imposed gender norms and low self-esteem to institutional biases and limited access to role models—hinder

equitable career outcomes (Mutekwe & Modiba, 2012; Dasgupta & Stout, 2014; Tenenbaum & Leaper, 2003; Acker, 1990).

The study's problematic centers on how deep-rooted gender ideologies, reinforced through familial socialization and institutional practice, shape women's perceptions of self and career possibilities in science. Social Role Theory provides a theoretical foundation for understanding how traditional norms ascribe caregiving and non-technical roles to women, thus discouraging them from pursuing scientific ambitions (Eccles, 2007; Cheryan et al., 2011; Martinot et al., 2012; Correll, 2004; Ely & Meyerson, 2000). Simultaneously, Gendered Organization Theory illuminates how educational and professional institutions subtly exclude women by embedding male-centric values into curricula and leadership structures (Acker, 1990; Britton, 2000; Kelan, 2009; Morley, 2005; Connell, 2006). At CUR, nearly half of the female science students cited a lack of role models and institutional support as demotivating



factors, underlining the need to interrogate both cultural and structural mechanisms.

This study holds considerable relevance for gender equity by highlighting the lived experiences of Rwandan female science students as they navigate educational and professional landscapes. Findings affirm the importance of institutional enablers, such as mentorship (74%), academic support (82%), and financial sponsorship (68%), which serve as transformative agents that counterbalance socio-cultural barriers (Robeyns, 2005; Nussbaum, 2011; Walker, 2006; Etzkowitz et al., 2000; Dennehy & Dasgupta, 2017). Importantly, these interventions do more than support academic success; they foster self-efficacy and resilience, encouraging female students to reimagine their potential in male-dominated fields (Bandura, 1997; Cranton, 2006; Mezirow, 1991; Packard, 2016; Lockwood, 2006).

From an anthropological standpoint, the study contributes to broader discourses on gender, identity formation, and institutional power in postcolonial African contexts. It reveals how educational institutions serve as sites of both reproduction and resistance to gender norms, and how students' agency is shaped within intersecting fields of cultural meaning, policy, and power (Cornwall, 2005; Stromquist, 2014; Nussbaum, 2003; Smith, 2011; Walker & Unterhalter, 2007). By analyzing the interplay of tradition and transformation in science education, the study positions itself as a valuable contribution to anthropological science, offering a nuanced understanding of gender as both a constraint and a capacity in the African educational experience.

2. Methodology

This study employed a mixed-methods approach to explore the barriers and enablers shaping female science students' university-to-work transitions at the Catholic University of Rwanda (CUR). Both qualitative and quantitative methods were integrated to ensure a comprehensive understanding of the lived experiences, institutional dynamics, and socio-cultural influences on female participation in science. Quantitative data were collected through a structured questionnaire administered to a representative sample of female science students, while qualitative insights were derived from focus group discussions and in-depth interviews with students, alumni, faculty, and employers (Creswell & Plano Clark, 2011; Tashakkori & Teddlie, 2003; Morse, 2003; Greene, 2007).

The total number of science students at CUR is 1,778, of whom 60% (n = 1,067) are female. The sample size for the quantitative survey was determined using Yamane's formula for sample size calculation:

$$n = N / [1 + N(e^2)],$$

where n is the sample size, N is the population size (1,067), and e is the margin of error (0.15 for exploratory research). This yields a sample of approximately 45 students. The sample consisted of female students in Year 2, Year 3, and Year 4 from all science programs, across the day, weekend, and holiday modes of study, and from both Taba and Save campuses. This stratified sampling ensured representativeness across academic years, campuses, and study modes (Cohen, Manion, & Morrison, 2018; Creswell, 2014; Fraenkel et al., 2012; Babbie, 2010).

Data collection techniques included: (1) a self-administered questionnaire capturing demographic profiles, perceptions of barriers/enablers, and career aspirations; (2) focus groups for shared reflections on mentorship and gender norms; and (3) semi-structured interviews to deepen understanding of institutional practices. Triangulation enhanced validity, while ethical standards were upheld through informed consent and anonymity (Patton, 2002; Denzin & Lincoln, 2011; Miles, Huberman, & Saldaña, 2014; Guba & Lincoln, 1989).

3. Gender Equity and University-to-Work Transitions

3.1. Socio-Cultural Barriers to Female Participation in Science

Female participation in science remains hindered by deep-rooted socio-cultural factors, even as Rwanda advances in gender equality in education. Drawing from the experiences of female science students at the Catholic University of Rwanda (CUR), this study underscores how entrenched gender norms continue to shape educational and career trajectories. According to Social Role Theory, societal expectations historically assign caregiving and nurturing roles to women, while associating scientific and technical domains with masculinity (Eagly & Wood, 2012; Ridgeway, 2009; Eccles, 2007; Cheryan et al., 2015). These culturally ascribed roles influence how families perceive women's suitability for science careers, often discouraging them from pursuing such paths. Data from CUR reveal that 49% of female science students reported family-imposed gender norms as a significant constraint. In many Rwandan households, girls are socialized to prioritize domestic roles over academic or professional ambitions, limiting their confidence and narrowing their career choices (Mutekwe & Modiba, 2012; Unterhalter, 2013; Elu & Price, 2010; Nzabonimpa, 2021).

In parallel, Gendered Organization Theory highlights how institutional practices embed masculine norms, creating environments that disadvantage women in male-dominated fields (Acker, 1990; Britton, 2000; Kelan, 2009; Ely & Meyerson, 2000). Within universities and workplaces, women often experience subtle exclusion through gender-insensitive curricula or the absence of female mentors. At CUR, 45% of respondents indicated that limited access to female role models in science weakened their aspirations and undermined their visibility in STEM fields. Without relatable figures who have succeeded in scientific careers, female students may internalize the belief that such careers are unattainable, reinforcing a self-perpetuating cycle of underrepresentation (Dasgupta & Stout, 2014; Sadler et al., 2012; Sege et al., 2015; UNESCO, 2017).

Another critical socio-cultural barrier is the influence of societal expectations, cited by 62% of students. Rwandan society, despite significant strides in promoting female education, still harbors implicit biases about gendered professions. Fields like nursing and teaching are often seen as more "appropriate" for women, while engineering, physics, and ICT are culturally coded as male domains (FAWE, 2011; UNESCO, 2019; Morley, 2005; African Union, 2015). These perceptions not only shape student aspirations but also affect hiring practices and career progression, sustaining occupational segregation.

Moreover, 56% of CUR's female science students cited low self-esteem as a major barrier. The interplay of family discouragement,

societal bias, and institutional inequity erodes confidence and leads many young women to question their competencies (Bandura, 1997; Tenenbaum & Leaper, 2003; Correll, 2004; Martinot et al., 2012). Social Role Theory explains that persistent exposure to gender-stereotypical roles gradually internalizes into self-concepts,

discouraging agency and ambition. Therefore, CUR’s gender-equity initiatives, such as mentorship, academic support, and inclusive programming, are vital in rebuilding self-esteem and counteracting societal barriers.

Table 1: Socio-Cultural Barriers Impacting Career Choices of Female Science Students at CUR

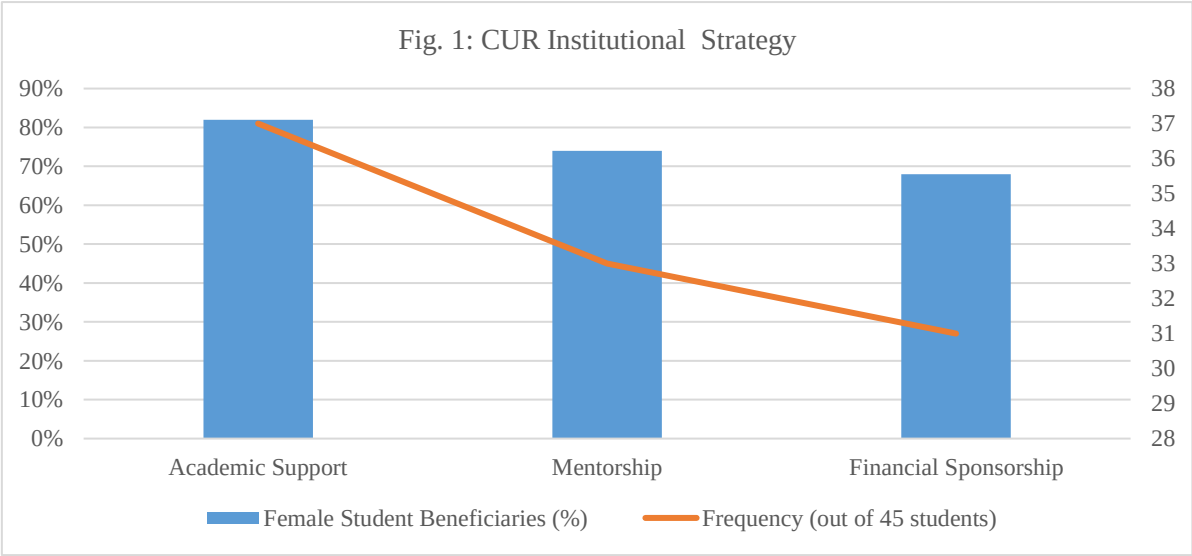
Barrier	% of Respondents Affected	Impact on Career Choice
Family-imposed gender norms	49%	Discouraged from "male" careers; directed toward caregiving roles
Societal expectations	62%	Internalized beliefs about “appropriate” female professions
Limited female role models	45%	Lack of inspiration and vision for STEM careers
Low self-esteem (linked factor)	56%	Reduced confidence to pursue competitive science roles

In conclusion, the findings highlight that female science students at CUR navigate complex socio-cultural landscapes. Addressing these barriers requires a multipronged approach rooted in policy, pedagogy, and cultural transformation. Theoretical lenses such as Social Role Theory and Gendered Organization Theory provide critical insights into how beliefs and structures perpetuate gender disparities. CUR’s gender-sensitive strategies offer a replicable model to dismantle these barriers and create an inclusive environment for women in science.

3.2. Institutional and Structural Enablers Promoting Gender Equity

The Catholic University of Rwanda (CUR) has demonstrated a progressive commitment to gender equity, particularly in supporting female science students through institutional strategies that address

structural inequalities and expand capabilities. Drawing on Sen’s Capability Approach (1999), these interventions aim to enhance individuals’ real freedoms, their capabilities, to choose and act in ways they value. CUR’s core strategies, academic support (82%), mentorship (74%), and financial sponsorships (68%), operate as institutional enablers that transform potential into actual achievements (Nussbaum, 2003; Unterhalter, 2005; Walker & Boni, 2006). From the Gendered Organization Theory lens (Acker, 1990), these strategies challenge entrenched gender hierarchies within academic and labor structures, helping dismantle the masculine norms embedded in science education and employment pathways (Connell, 2006; Britton, 2000; Morley, 2005). The evidence from CUR’s administration and the female respondents reveals how these targeted measures facilitate more equitable university-to-work transitions.



Academic support, cited by 82% of female science students, includes tutoring, research coaching, and skills workshops. Such interventions enhance functionings, what individuals are able to do and be, and help counteract the educational disadvantages girls often face due to prior gendered schooling practices (Unterhalter, 2005; Tikly & Barrett, 2011; Robeyns, 2003; Walker, 2006). CUR’s curriculum also fosters agency through project-based learning and inclusive pedagogies. According to Acker (1990), academic structures often reflect male-centered values, but CUR’s pedagogical reforms indicate a move toward de-gendered academic spaces that support diverse learners. This shift boosts not only academic success but long-term employability, with more than 90%

of CUR’s female science graduates transitioning into careers in healthcare and education.

Mentorship, reported as influential by 74% of respondents, serves as a critical capability-enhancing mechanism. Female mentors, both internal (faculty) and external (industry professionals), disrupt gendered silences in science and offer alternative career narratives that validate female aspirations (Etzkowitz et al., 2000; Morley, 2013; Leathwood, 2006; Smith, 2011). According to Gendered Organization Theory, mentoring helps reframe leadership and competence outside traditional masculine norms, legitimizing women’s presence and contributions in scientific fields (Britton, 2000; Ely & Meyerson, 2000). Mentorship also builds “conversion

factors” that translate educational achievements into practical work outcomes (Robeyns, 2005), thus reducing the attrition of female talent between graduation and employment.

Financial sponsorship, accessed by 68% of the female science students surveyed, plays a foundational role in overcoming poverty-linked gender inequities. It levels access to resources, allowing students from disadvantaged backgrounds to participate in high-cost disciplines such as nursing, biomedical science, and environmental health. Through the Capability Approach lens, this support removes a key structural barrier to choice, allowing female students to pursue studies aligned with their aspirations rather than dictated by affordability (Walker & Unterhalter, 2007; Nussbaum, 2011; Boni & Gasper, 2012; Cornwall, 2005). From an organizational standpoint, CUR’s funding prioritization reflects a deliberate institutional break from gender-neutral budgeting, directly addressing the gendered effects of economic exclusion.

Overall, CUR’s institutional responses serve as best practices in creating gender-responsive and equitable learning environments. These initiatives demonstrate how universities, through intentional design and supportive structures, can confront and transform the gendered nature of science education. Embedding such policies into institutional culture fosters not only access but genuine participation and leadership for women in science, disrupting conventional career pathways and affirming equity as a central academic value (Morley, 2013; Acker, 2006; Leathwood & Read, 2009; Connell, 2006).

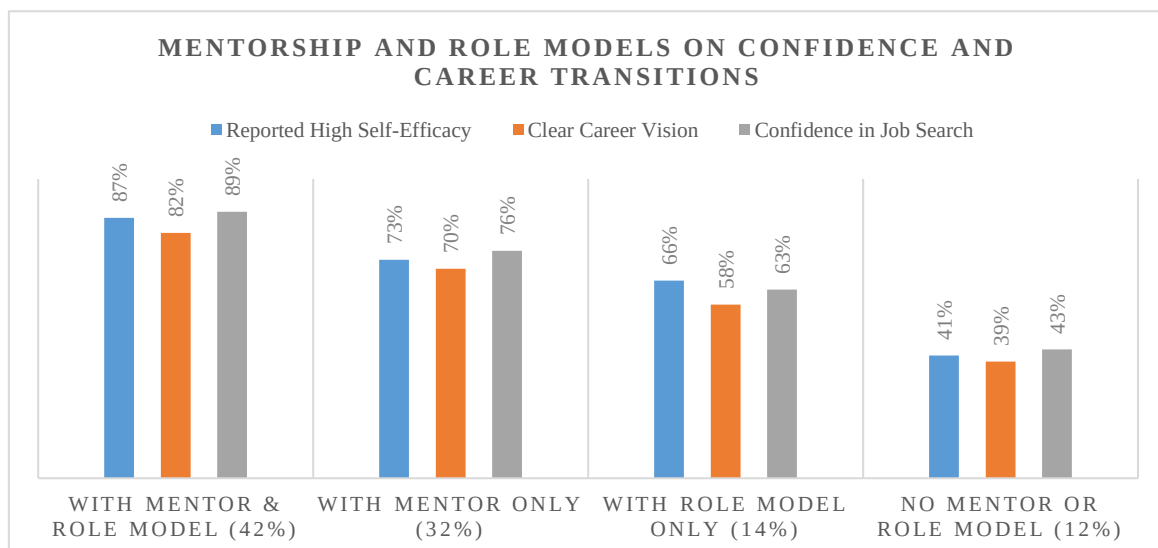
3.3. The Impact of Mentorship and Role Models on Confidence and Career Transitions

Mentorship and the visibility of successful role models are critical enablers of female students' confidence and university-to-work transitions in science disciplines at the Catholic University of Rwanda (CUR). Data collected from CUR indicates that 74% of female science students identified mentorship as a key enabler of their academic and career journey, while 45% cited the presence of

successful women in science as a source of motivation and career orientation. These findings align with Bandura’s Self-Efficacy Theory, which posits that individuals' beliefs in their capabilities to achieve specific goals are shaped by mastery experiences, vicarious learning (observing others), verbal persuasion, and emotional arousal (Bandura, 1997). Female students at CUR reported increased self-efficacy when engaging in mentorship programs and interacting with female scientists during internships and academic seminars. Mentors helped demystify scientific career pathways and reduced the fear of failure, a barrier identified by 56% of students who admitted to struggling with low self-esteem. Studies have shown that mentoring relationships can significantly boost academic resilience and help young women navigate male-dominated fields (Dennehy & Dasgupta, 2017; Crisp & Cruz, 2009; Packard, 2016; Kim et al., 2018).

The transformative impact of mentorship is further illuminated through Mezirow’s Transformative Learning Theory, which emphasizes the role of critical reflection and dialogue in reshaping individuals’ worldviews and enabling personal and professional development (Mezirow, 1991). In focus group discussions, CUR students described how interactions with female mentors helped them reframe limiting gender narratives inherited from family or community. For instance, 49% of students reported family-imposed gender norms as a barrier; however, mentorship provided spaces for critical dialogue that helped challenge and reinterpret these norms. Emotional support from mentors fostered not only cognitive shifts but also psychological empowerment. This aligns with literature on transformative learning where guided reflection leads to greater autonomy and stronger career identity in female learners (Taylor, 2008; Illeris, 2014; Dirkx, 2006; Cranton, 2006).

Figure 2 below illustrates the correlation between mentorship, access to role models, and levels of self-efficacy and confidence as reported by CUR respondents:



The data illustrates that access to both mentorship and visible female role models significantly enhances students' confidence and clarity regarding career direction. The dual impact boosts self-efficacy and helps students internalize a belief in their own potential, despite societal expectations (62%) and institutional biases (41%) that often undermine women in science. This is consistent with findings in

global literature, which demonstrate that visible success stories in the sciences can counteract stereotype threat and promote sustained engagement in STEM fields (Cheryan et al., 2011; Dasgupta, 2011; Lockwood, 2006; Herrera et al., 2012).

Psychologically, mentorship also offers a buffer against emotional fatigue, imposter syndrome, and academic burnout, conditions frequently reported by female students in male-dominated academic settings. Mentors serve as emotional anchors, guiding students through transitions, offering coping strategies, and validating their struggles and successes. Transformative learning occurs when these emotional experiences are processed and integrated into a renewed sense of agency and aspiration (Dirkx, 2001). At CUR, 68% of students who participated in mentorship programs indicated a stronger sense of career purpose and reported increased motivation to pursue postgraduate studies or competitive job opportunities.

In conclusion, the CUR model demonstrates that mentorship and role models play a transformative role in enhancing female students’ psychological readiness, academic confidence, and career preparedness. These findings reinforce the need to institutionalize mentorship programs, broaden access to female role models, and integrate reflective learning practices to build resilient and self-assured science graduates.

3.4. Replicability of CUR’s Gender Equity Model and Policy Implications

The Catholic University of Rwanda (CUR) presents a promising model for promoting gender equity in science education, particularly in contexts where socio-cultural constraints and institutional limitations have historically impeded women’s full participation. CUR’s multifaceted interventions, academic support, mentorship, and scholarships, have measurably improved female representation in science fields, as evidenced by the 60% female enrollment rate and a 90% employment rate post-graduation (CUR Administrative Report, 2024). These achievements suggest that the CUR model offers a replicable framework for other institutions in Rwanda and the broader East African region (Nzomo, 2017; Tusiime et al., 2020; FAWE, 2021; UNESCO, 2022). Rooted in the Capability Approach (Sen, 1999; Nussbaum, 2011), CUR’s initiatives aim not only to provide opportunities but also to expand real freedoms for women to pursue science careers and live lives they value.

CUR’s success is underpinned by institutional strategies designed to counteract both structural and cultural barriers. A synthesis of respondent data and institutional records yields the following framework for replication:

CUR Strategy	Frequency (n)	% of Respondents (n=45)	Policy Focus	Replicability Potential
Academic tutoring and support programs	37	82%	Academic preparedness	High: scalable with minimal cost
Structured mentorship (female scientists)	33	74%	Role modeling, professional growth	Moderate: needs committed personnel
Financial sponsorships	31	68%	Economic empowerment	High: potential for public-private partnerships
Career counseling and alumni networks	27	61%	Transition to labor market	High: depends on institutional will
Gender equity sensitization workshops	25	55%	Cultural transformation	Moderate: long-term social investment

As shown in the table, these strategies combine both low-cost and high-impact interventions, making the CUR model adaptable to institutions with varying resource capacities. The Capability Approach emphasizes that education must go beyond formal instruction to expand individuals’ “functionings”, in this case, the ability of young women to convert educational resources into professional success (Robeyns, 2005; Walker, 2006). Therefore, policy responses must address both opportunity structures and individual agency.

Key to replicability is the implementation of gender-sensitive curricula that challenge stereotypes and incorporate diverse perspectives. Research shows that inclusive curricula improve girls’ sense of belonging in science disciplines (Arnot & Phipps, 2003; Morley, 2010; Unterhalter, 2013; Leach, 2015). CUR’s approach aligns with this recommendation, integrating case studies and examples that elevate women’s contributions to science. Institutions across East Africa should embed similar pedagogies to counteract implicit biases and support identity formation among female students.

Another essential policy is community sensitization. Respondents reported that societal expectations (62%) and gendered family roles (49%) continue to limit their freedom to fully engage with science

education and careers. CUR addresses these constraints through community engagement programs, including parent-student forums and outreach campaigns, which reshape norms and expectations. As supported by Stromquist (2014), community-based interventions are critical in contexts where gender norms are deeply rooted.

Expanded mentorship networks, particularly those that include successful female alumni, are also crucial. Female students often lack visible role models in science, with 45% of CUR respondents citing this as a major barrier. Mentorship not only builds confidence but also provides strategic guidance in navigating academic and professional landscapes (Jacobs & Eccles, 2000; Grant & Hallman, 2008; FAWE, 2021; EAC Gender Barometer, 2022). Policy frameworks should institutionalize mentorship by allocating time, recognition, and resources to mentor-mentee relationships.

Lastly, scholarships targeted at female science students remain indispensable. With 68% of respondents relying on financial sponsorships, it is evident that economic barriers are still significant. National and institutional policies should allocate dedicated funds to support women in STEM through need-based and merit-based grants, possibly in collaboration with the private sector and development partners (World Bank, 2019; African Development Bank, 2020; UNESCO, 2022; Rwanda Ministry of Education, 2023).

In conclusion, the CUR model—anchored in the Capability Approach—demonstrates how an institution can translate gender equity from aspiration to implementation. For sustainable impact, regional education systems must invest in policies that address both systemic constraints and individual empowerment, ensuring that female science students not only access education but thrive through meaningful transitions into the workforce.

3.5. Transitions from University to Work: Employability and Self-Employment

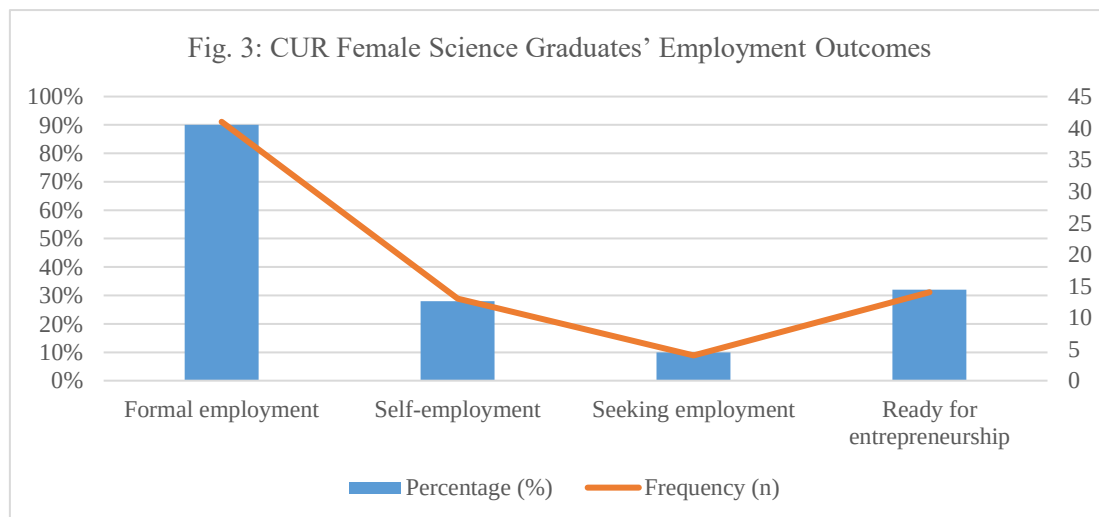
Gender equity plays a pivotal role in shaping the transitions of female science students from university to work, particularly in the context of Rwanda, where historical and socio-cultural constraints continue to influence educational and professional outcomes. At the Catholic University of Rwanda (CUR), although women represent 60% of the 1,778 science students, many still face substantial barriers when transitioning into the workforce. Social Role Theory explains how gender stereotypes allocate women to caregiving and domestic spheres, reinforcing the perception that science and technical careers are male domains (Eagly & Wood, 2012; Ridgeway, 2009; Cheryan et al., 2015; Eccles, 2007). These perceptions negatively affect students' confidence and limit their career aspirations. The data revealed that 56% of students struggled with low self-esteem and 49% with gendered family expectations, both of which contributed to narrowed opportunities in the labor market.

Institutional strategies at CUR have been instrumental in improving employability for female science students. Over 90% of female science graduates secured jobs within one year of graduation, primarily in education and healthcare. This success is largely attributed to CUR's gender equity initiatives, including academic support (82%), mentorship (74%), and financial sponsorships (68%) (Nussbaum, 2011; Robeyns, 2005; Walker, 2006; Dennehy &

Dasgupta, 2017). These interventions directly enhance students' "conversion factors"—resources needed to translate education into employment. For example, mentorship programs provide role models and career guidance, while academic support equips students with skills that align with employer expectations (Etzkowitz et al., 2000; Morley, 2010; Leathwood & Read, 2009; Smith, 2011).

Beyond formal employment, self-employment is emerging as a viable pathway for CUR female graduates, especially in applied sciences such as environmental health, food processing, and biomedical technology. However, only 28% of students reported readiness for self-employment due to limited entrepreneurial training and access to capital. Gendered Organization Theory suggests that institutional structures still reflect male-dominated values, where entrepreneurship is often not integrated into the science curriculum in a gender-responsive manner (Acker, 1990; Kelan, 2009; Britton, 2000; Connell, 2006). Despite these limitations, a minority of CUR graduates have ventured into consultancy, health services, or small-scale agro-processing businesses, indicating the potential of entrepreneurship as a tool for economic empowerment and independence.

Efforts to improve transitions from university to work must integrate career counseling, entrepreneurship training, and inclusive policy frameworks that recognize the diverse ambitions of female science students. Community sensitization programs targeting families and employers are equally essential to dismantle normative barriers that hinder women's full participation in science careers (Stromquist, 2014; Cornwall, 2005; UNESCO, 2022; FAWE, 2021). The Capability Approach reinforces the notion that equitable transitions must focus not only on access to education but also on expanding real freedoms, opportunities to achieve valued goals, whether in formal employment or self-driven ventures (Sen, 1999; Nussbaum, 2003; Walker & Unterhalter, 2007; Boni & Gasper, 2012).



In conclusion, gender equity initiatives at CUR have significantly enhanced female students' transitions into employment, yet more targeted support is needed to strengthen self-employment outcomes. Aligning education with labor market needs and challenging socio-cultural norms remain critical to achieving sustainable gender equality in science careers.

4. Conclusion

This study employed a mixed-methods design to investigate the enablers and barriers affecting female science students' transition from university to the workforce at the Catholic University of Rwanda (CUR). Data were collected through a self-administered questionnaire distributed to a representative sample of 45 female science students—drawn from a population of 1,067 across all

programs, levels (Year 2 to Year 4), study modes (day, weekend, and holiday), and both campuses (Taba and Save). The sample size was determined using Yamane's formula to ensure statistical reliability for exploratory research. Qualitative techniques included focus group discussions and semi-structured interviews with students, alumni, faculty, and employers, allowing for triangulation and deeper insight into institutional and socio-cultural dynamics.

The hypothesis guiding this research posited that while female science students at CUR face significant socio-cultural and institutional barriers, targeted institutional interventions—such as mentorship, academic support, and financial sponsorship—enhance their confidence, academic performance, and university-to-work transitions. The findings confirmed this hypothesis: 82% of respondents cited academic support as a key enabler, 74% highlighted mentorship, and 68% pointed to financial sponsorship as essential. At the same time, major barriers such as low self-esteem (56%), family-imposed gender norms (49%), and limited role models (45%) persisted.

The study concludes that CUR's gender equity strategies effectively mitigate the structural and cultural constraints faced by female science students. The verified hypothesis reinforces the need for holistic, gender-responsive educational policies and institutional practices that promote inclusive participation and long-term empowerment of women in science-related careers.

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