

WOMEN'S PERSPECTIVES ON SCIENCE, ENGINEERING AND TECHNOLOGY¹

This comprehensive review explores the human capital challenges that relate to women in science, engineering and technology (women in science), as well as issues relevant to how women benefit from research (science for women). The underlying challenges are:

- Understanding why there are so few women in the science, engineering and technology sector;
- Helping more women to succeed in science, engineering and technology;
- Making scientific research more responsive to women's needs.

Women in Science

A statistical overview reveals the following key issues in the academic environment in South Africa:

- Women are concentrated in the health sciences, social sciences and humanities, whilst men predominate in the natural sciences and engineering;
- There are far fewer women than men in senior management positions and the professoriate;
- Female academics produce fewer research publications than men, and they are less likely to hold a doctorate.

While girls perform well (often better than boys) at school level, many women "disappear" at all stages of academic development. The literature shows that at the early stages of a science career women experience the so-called "threshold effect", and later in life they battle the "glass ceiling". A mix of culture and role conflicts contributes to the following barriers:

- Anxiety that stems from negative attitudes towards science;
- Negative perceptions about their own suitability for a career in science, engineering and technology, resulting from gender stereotyping that is upheld and reinforced by parents, educators, partners and the mass media;
- Lack of confidence in their own abilities in these fields, resulting in attrition, low research outputs and limited professional development;
- Negative attitudes of male supervisors and co-students that further erode women's sense of self-worth and exacerbate their lack of confidence;
- Working in isolation from women peers and lack of female mentors;
- Exclusion from decision-making, especially at informal activities;
- Exclusion from management positions in academia because they lack managerial training or don't meet changing criteria;
- Men who ignore or dismiss contributions made by women;
- Outdated appointment procedures, nepotism and patronage that favour men;
- Age restrictions (for example when applying for bursaries) that disadvantage women, because of greater discontinuity in their careers;

¹ The full report "Looking at SET through Women's Eyes" was published in March 2005, and is available from the National Advisory Council on Innovation (NACI)

- Gender bias in selection criteria for bursaries, grants and scholarships;
- Different gender expectations of men and women (autonomous *vs* supportive) that contribute to the marginalisation of women;
- Difficulty in relocating to a new position in another city or country experienced by women who are married or have young children at school;
- A highly competitive work culture that forces women to choose between an academic career and a family role, especially in prestigious research centres;
- Marriage and motherhood and the demands of coping with the bulk of family responsibilities in an intensive and inflexible work environment;
- Battling to catch up in fast-moving fields after a career break due to childbearing;
- High workloads and stress that lead to fatigue, burnout and ill health.

The study found that even though they want to stay in research, women with young children often opt for other employment opportunities, because they find it too difficult to balance a high-pressure research career with family responsibilities.

The study goes on to identify a number of factors that facilitate the participation and progress of women in science, engineering and technology. Role models, mentoring and support networks emerge as key strategies to support and advance women in science.

As women scientists are carving out a new professional identity for themselves, role models who are able to integrate professional and personal concerns can be powerful confidence-builders for young, female scientists coming up the ranks. These role models help younger women envision a future in science. Documenting the oral histories of women scientists can help other women learn from these experiences.

Sharing concerns and supporting each other with career advice can be a very successful strategy to overcome isolation and cope with an alienating, male-dominated environment. It also provides a platform and voice to help get women in key decision-making positions in the sector.

More creativity and flexibility in course schedules and work policies, more training opportunities and a supportive work environment with access to childcare will help women to progress in their science careers.

Science for Women

An earlier NACI study, published in 2004, showed that women's issues are vastly underrepresented in scientific research and development. The later study also found that women have long been criticising science curricula and research agendas because of its male bias. Gender bias in experimental design and the interpretation of research results also contribute to women not benefiting from research.

In order for women to benefit, they must be clearly identified as beneficiaries of research and involved throughout the research cycle. Research must also cater for women from diverse educational and social backgrounds. Research workers must be

made more aware of how their work impacts the end-user and particularly men and women separately.

The report includes case studies that show how research often does not cater for women's needs in fields such as medicine, transport, water supply and ergonomics, as well as in the design of equipment for use in agriculture and construction.

The study concludes that it is neither feasible, nor effective for research to be gender neutral. Because the needs and interests of men and women often differ, research must recognise and cater for this diversity. It is therefore essential that research funders must recognise the importance and complexities of the gender dimensions of research and this must be reflected in their policy and funding guidelines. This includes involving women as key decision makers in the allocation of research funds.