Chapter 9
Factors Contributing to the Success of Women Working in Science, Engineering and Technology (SET) Careers

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ABSTRACT

Women's under-representation in Science, Engineering and Technology (SET) careers is a problem in South Africa. This chapter discusses structural and individual barriers responsible for the under- representation of women in SET. Self-efficacy as a requirement for success in SET is discussed. The results are illustrated with a report on a study done with a sample of 29 women in successful SET careers. These women experienced some form of gender discrimination at some stages of their development from school to career. They also struggle with family and work balance and similar issues. However, the sample ascribed their success or the fact that they stay in a SET career mostly to personal characteristics and strong self-efficacy beliefs. Aspects such as a drive for achievement, strong goal orientation, passion for their work, determination and perseverance were identified. Strong self-efficacy beliefs which can be associated with resilience and cognitive hardiness came to the fore. These women believe that they can achieve their goals and they do to a large extent.

INTRODUCTION

The under-representation of women in Science, Engineering and Technology (SET) careers is a worldwide well-known phenomenon and presents many challenges that are not yet solved (Hodgson, 2000). South-Africa is no exception. Although more than 50% of students at tertiary educational level were women in 2001, data showed that women were still severely under represented in SET fields of study (National Advisory Council on Innovation (NACI), 2004). The purpose of this chapter is to discuss some of the barriers to women entering

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science and difficulties accounting for women leaving science in order to find a clue to what makes women in SET careers successful. The ideas are illustrated with research done in South Africa exploring the career histories of 29 successful women in SET careers. On the one hand we indicate the difficulties they have encountered on their way to success in their careers, but on the other hand we also indicate what factors account for their success. It is suspected that self-efficacy mediates success in women in SET and that the mere breakdown of institutional or personal barriers is not sufficient for ensuring a successful SET career for women.

BACKGROUND

A metaphor frequently used to describe the under-representation of women in SET is the "leaky pipeline" (Pell, 1996). Women are lost for SET fields along the development of their careers from school and at various other crucial life milestone phases (cf. the funnel model of Cronin & Roger, 1999). In the remainder of this section we will give a brief overview of the usual reasons for leakage and also indicate what we think is responsible for success in a SET career.

Blickenstaff (2005) gave an overview of factors he found in literature for the under representation of women in SET (see also Cronin & Roger, 1999). He found that some factors provided good reasons why women are leaving SET fields whilst others did not stand up to scrutiny. He cited the following reasons from research why women leave SET: (a) biological differences between men and women, (b) girls are not well prepared for a science career, (c) girls have a negative attitude towards science and did not have positive experiences with science at school, (d) there are no role models in science for girls, (e) science curricula do not apply to girls, (f) pedagogical styles of science classes fit boys better than girls, (g) there is what Blickenstaff (2005, p. 372) calls a "chilly climate" in science classes towards girls, (h) it is expected that girls conform to traditional gender roles and (i) the worldview imbedded in scie4nce is masculine. These nine categories can be divided into individual factors and institutional or structural factors which are in principle external to the individual and are briefly discussed below (Fox, 1998; Sonnert, Fox, & Adkins, 2007).

Structural Barriers

a. Although SET fields are deplete of female role models, having more role models does not necessarily mean that women will be attracted or retained in SET careers (Blickenstaff, 2005). Empirically the effect of role-models still has to be unravelled (Buck, Clark, Leslie-Pelecky, Lu, & Cerda-Lizarraga, 2008; Downing, Crosby, & Blake-Beard, 2005; Murrell & Zagenczyk, 2006), and if women role models operate in a discriminatory environment it sends the message that women still have it tough and thus it is an environment to be avoided or to be accessed only by conforming to the male model of operating (Blickenstaff, 2005).

b. Blickenstaff (2005) is of the opinion that much has been done to eliminate gender bias from science curricula materials and design. The argument is that females experience the lack of female (or black or other minorities) examples in text books negatively.

c. Teachers can create an environment that fosters interest in science and mathematics (Roger & Duffield, 2000) but any negativity from their part against females can detrimentally influence girls interests and choices (Stewart, 1998) The way a teacher deals with children, for instance, by favouring boys in terms of reacting more positively and encouragingly to their questions and reactions can obviously send a clear message to girls (Alper, 1993; Blickenstaff, 2005). Even allowing boys more access to technological environments and discouraging girls can further strengthen the message that girls are supposed to conform to

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