

## CHAPTER 6

# EQUITY ISSUES IN SCIENCE EDUCATION

### WHY I CONDUCTED THE STUDY

*The International Handbook of Science Education* was commissioned by Kluwer Academic Publishers for their handbook series which was edited by Barry Fraser and Kenneth Tobin. These two editors invited me to take responsibility for editing one of the ten sections in the handbook. This was the section on equity. They also invited me to write the lead article for this section. As such, this article was not a study but a review of the literature in science education.

### METHODOLOGICAL DECISIONS

This chapter of the handbook was to be a review of the research in science education on the topic of women and minorities in science around the world. It needed to address seven broad areas of equity and to be balanced in terms of what was happening world-wide. This was a challenge for two reasons. First, as with any publication, there was a page limit to what I was to write. Second, the research literature was skewed. More was written about the topic as it pertained to North America, especially the United States, and to Australia and Europe. Less information and research was available for other parts of the world. As a check on the thoroughness and balance of the review I was fortunate to have as a chapter consultant, Svein Sjøberg from Oslo University in Norway. He pushed me to be as comprehensive as possible to reflect a global perspective. His comments were invaluable in the revisions of the chapter.

As many of the science education journals that I could access as well as *Science* were searched for research on the topic of gender equity. These included *Journal of Research in Science Teaching*, *Science Education*, *International Journal of Science Education*, *Journal of Research in Mathematics Education*, *Journal of Women and Minorities in Science and Engineering*, and the *Australian Science Teachers Journal*. I also scoured more general journals of educational research such as the *American Educational Research Journal* and *Review of Educational Research*. International studies of achievement were helpful as were government websites, conference papers, books, conference presentations, earlier handbooks, and dissertations. Non-English publications were not included due my inability to read them.

## SCIENCE EDUCATION AT THE TIME OF THE STUDY

Science education was becoming more interested in issues of gender as well equity for other underrepresented groups such as the homeless. This interest was situated in a larger context of educational reform in science education and led to the publication of three special issues of the *Journal of Research in Science Teaching*. In 1998, issue 35, 7 was dedicated to an examination of policy and recommendations for the future. This was followed by issue 35, 8 which was dedicated to gender. Issue 35, volume 4 in 1998 was another special issue examining pedagogy in science education from a feminist, critical, and post structuralist perspective. Authors in this issue used theories of race, gender and class to bring to the forefront inequities. These three special issues resulted in many more review articles than usual that provided a synopsis of the research as well as a critique. Articles in *Science Education* also focused on minority students, culture, and language using similar theoretical frameworks.

In addition to feminist, critical and post structuralist approaches and the theories that reflected these positions, science education scholars were also situating their work in a constructivist paradigm. Researchers working from a constructivist perspective were interested in conceptual change, situated cognition, and metacognition. Problem solving, reasoning, and conceptual integration as measured by concept maps were explored in various content areas and at various grade levels. Studies addressing learning in a variety of topics in biology and physics were the most common followed by studies of chemistry topics. As noted in previous descriptions of science education research at the time of a study in other chapters, Earth science was not addressed. Science education research in informal settings was featured in a 1997 special issue in *Science Education* (volume 8, issue 7).

Studies of students predominated in the literature with equal attention given to secondary and elementary grades. Junior high school or middle school studies appeared less frequently. Studies at the university level whether examining students or faculty were scarce and studies of the community college were almost nonexistent. Studies that examined teacher preparation were predominantly studies of the impact of elementary methods courses on various outcomes. Studies of practicing classroom teachers focused on their identity, growth, pedagogical content knowledge, or the teacher as knower or researcher. Some of the studies of pre-service teachers and practicing teachers addressed feminist pedagogy and perspectives in the teaching of science. Methodologically there was also a shift from earlier times. Quantitative and qualitative studies appeared in comparable numbers although mixed methods were used less frequently. Among the qualitative studies, designs using case study and interviews predominated.

Another strong indicator of the interest in gender issues in science education could be found in the Science and Technology Education Library series of Kluwer Academic Publishers. As part of the series Parker, Rennie, and Fraser (1996) edited a book called *Gender, Science and Mathematics: Shortening the Shadow*. Chapters