

CULTURALLY BASED GENDER BIAS IN SCIENCE EDUCATION

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Abstract. *A study of gender, science, and technology involves both biological and historical issues. Behavioral differences between women and men have been researched and can be attributed to the historical roots of a culture's attitudes and practices. Through both anthropological and educational research, the author has investigated gender bias, particularly in science and mathematics. Studies in several culturally diverse areas, including parts of Africa, Cuba, and Asia, are an integral part of this research. In addition, women themselves are challenged to question their own views and those attitudes which they readily accept and teach to future generations.*

The primary purpose of this paper is the investigation of the cultural bases of gender role assignment and the need for addressing and changing cultural attitudes in order to provide greater educational equality and opportunities for females.

The 1995 Beijing "Platform for Action" recommendations stressed the need for women to have greater access to science education and technical training. In attempting to meet these recommendations in developed and developing countries, awareness has been heightened, governments have provided funding, programs have been instituted, and teachers given special training. However, there still remain serious cultural barriers to full participation by the world's women, especially in



the sciences and mathematics. How much of this impediment is culturally based? How much is due to culturally based biases of teachers and school administrators and the reluctance of parents to expose their daughters to the possibility of rejection by the society in which they live?

The social aspects of the teaching and learning of science are important, as are the customs and mores of each society. Some students may be favored over others; some students feel comfortable in the ambience, while others are alienated. Children bring different experiences and expectations to school and most of those are affected by family associations, ethnic background, social group, geographic location, and gender. In most societies, acculturation is strongly gendered—males and females have di-

fferent experiences, aspirations, and priorities—and gender roles are both rigid and restrictive.

This paper is an attempt to look at the historic inculcation of gender role acceptance in differing cultures and its effect upon the society's educational system, specifically in the teaching and learning of science and mathematics, in an effort to explain the persistence of gender bias in the face of concerted efforts to eliminate it.

Anthropologists use the term gender to refer to the cultural elaborations and meanings assigned to the biological differentiation between the sexes (Haviland, 1990). While sex refers to the biological differences between the male and the female, gender refers to the social classification of masculine and feminine (Nanda, 1975). Each classification carries with it a role, a set of behavioral expectations appropriate to that position. Role designation on the basis of gender goes back as far as recorded time, probably arising from biological differences between early hominid males and females—males then were probably twice the size of females—and even though those biological bases for gender role differences have largely disappeared, the cultural separation has persisted. Role designation on the basis of gender is almost universal—in almost all societies parents begin to train their

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children at an early age in the behaviors considered appropriate for their gender.

Gender role differentiation has been maintained in most cultures to some extent in order to meet the perceived needs of those human societies. These culturally mandated differences are far greater in some societies than in others. Margaret Mead (1963) carried out a study of three cultures in which she endeavored to determine if the characteristics defined as *feminine* in Western culture were universal. Her results indicated that all the behaviors, emotions, and interests which go into being masculine and feminine are patterned by the culture (Nanda, 1994: 70).

Research has indicated that gender differences were more extreme in late 19th and early 20th century Western (European and European derived) societies than among most of those whose ways of life are more like those of the late Stone Age ancestors of Western peoples (Haviland, 1990: 32), indicating that behavioral differences between men and women are not biological but are historically rooted in the societies' attitudes and practices.

The historical attitude of Western cultures toward women is reflected in the reports of such anthropologists as Bronislaw Malinowski. In a critical analysis of Malinowski's work, Annette Weiner (1987) wrote: "That Malinowski never gave equal time to the women's side of things... is not surprising. Only recently have anthropologists begun to understand the importance of taking women's work seriously. In the past both women and men ethnographers generally analyzed the societies they studied from a male perspective. The women's 'point of view' was largely ignored in the study of gender roles, since anthropologists generally perceived women as living in the shadows of men—occupying the private rather than the public sectors of society, rearing children rather than engaging in economic or political pursuits" (quoted in Haviland, 1990: 43).

Bias in the study of the activities of women is not restricted to anthropolo-

gists and ethnographers. If the culture sees the function of women as merely "shadows of men", subject to males and having little or no life outside the biological function (the one thing that men cannot do!) of bearing children and then rearing them, then the culture teaches its females that their proper role is submissive, passive subjection to the needs and desires of males in most, if not all, areas of life.

The primary purpose of this paper is to investigate the social and anthropological bases for gender bias in education, especially in mathematics and the sciences, and to endeavor to provide viable ways in which social attitudes may be change so that females may, just like males, achieve to the limit of their intellectual and physical abilities.

Reams of research findings have been published on gender bias in the United States and other technologically developed countries, most of which indicate that gender bias, especially in the teaching of science and mathematics, is both a fact and generally unrecognized by its practitioners and uncorrected, at least in elementary schools. The American Association of University Women has devoted many dollars and several years to an in-depth study entitled *Shortchanging Girls, Shortchanging America* (AAUW, 1991) which indicated that the problem does, indeed, exist in the schools in the United States.

In the years since World War II, women have been more visible and vocal in society, in many areas taking their place alongside men in the workplace. However, stereotypes persist—"it's foolish for a woman to prepare for a career in science; she'll just quit, get married and have children..."; "women are not good in math"; "science is a man's field"; and so forth—all of which tend to become institutionalized with the growth of the number of female-dominated households or those in which there is no male role model. Underpaid and undertrained women tend to pass along to their female children the belief, often instilled into them by their own female parent, that the role of the female is to

support the efforts of males to achieve in the workplace and in life in general. Society has long told women that they need less in order to maintain themselves and their children. The idea that "men work to support their families" while "women work to make a home for husbands and children" and if, heaven forbid, they work outside the home, it is only in order to "earn extra money for luxuries", has not been eliminated by the hard fact that a large number of women are the sole support of their families and many cannot afford some of the necessities of a decent lifestyle, much less luxuries, no matter how hard they work. Women, especially in the professions, are paid less than men, based upon the supposition that "women have husbands to support them and they don't need to work" and there is often overt hostility to women in the workplace as they are seen to be "taking jobs away from men who need them".

If we admit that gender bias is a fact, then we must also admit that there are reasons why the phenomenon is so prevalent in some areas of the technologically developed world while almost nonexistent in others. In the Russian Republic, and in the old Soviet Union, for example, there are as many women in traditionally male occupations as there are men and, of course, under the Communist system, all earned the same, albeit low, salaries. Women serve in the military alongside their male counterparts and they sail on ocean-going vessels as able "seamen", all without prejudice and with social approbation.

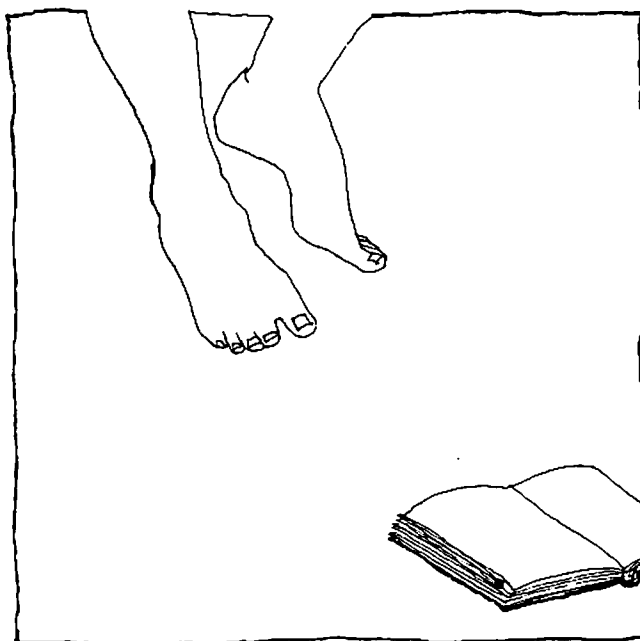
In Cuba, the Revolution of 1959 caused radical socio-cultural changes, especially in the lives of women. Although Cuba has not eliminated sexist attitudes, and even today has not fully incorporated women into the work force and the military, by 1975 one in three Cubans was actively involved in some phase of the educational process; women accounted for 49 percent in science, 47 percent in pedagogy, and 33 percent each in the medical sciences and economics (Cole, 1982b: 489). There has been a tremendous turnover in wo-

men in the Cuban work force, explained by Fidel Castro as being related to "all the residual male chauvinism and supermanism and all those things that are still a part of us" (quoted in Cole, 1982b: 492).

In many of the more developed African countries women occupy traditional child bearing/child raising roles and train their female children to follow in their footsteps, only rarely aspiring to careers outside the home environment, even when their fathers are university educated and they are part of the middle class. In some countries in Latin America, women are limited only by their ambition and a large majority graduate from college, many in the sciences, although they often leave their careers when they marry. Where the indigenous influence and/or religious restrictions are strong, girls, even the educated ones, rarely escape the traditionally limiting roles of wife and mother.

In studies on Asian refugee children living and studying in the United States (Caplan *et al.*, 1992), educational expectations for males and females appear to be similar, "Egalitarianism and role sharing were... associated with high academic performance... relative equality between the sexes was one of the strongest predictors of GPA. In those homes where the respondents disagreed that a 'wife should always do as her husband wishes', the children earned average GPAs of 3.16, while those whose parents agreed with the statement had an average GPA of 2.64" (p. 40). The conclusion of these researchers is that the "problem" with education as a whole, and, of course this can be applied as well to gender bias, is that the school is expected to transform the attitudes and behavior of children, many of whom are already "programmed" by cultural mores before they ever enter a school room.

If, as the author suspects, gender bias is culturally based—culture being defined as the entire way of life; material, intellectual, and spiritual facets of a given society and comprising knowledge, belief, art, morals, law, customs and any other capabilities and habits acquired by humans as members of society—then it is not sufficient to merely train teachers to avoid the pitfalls of gender bias in the classroom. Katherine Hanson (1993: 4), in a report on Urban Education, wrote, "With a broader understanding of this cultural context... Educators can begin to consciously change the culture to better respond to the educational needs of girls..."



Since a person's sex remains the same for life, the sex role, once learned, does not change greatly afterward. It is the attitude toward those sex roles which must change. Culture does not exist in a vacuum; nor is the human being a blank slate upon which the culture writes indelibly. Culture in most of today's world is dynamic and changing, responding to both inside and outside events; interaction rather than reaction. If the human being is a product of his or her culture, the immediate result of this cultural conditioning is a simplification of life, but with an accompanying stereotyping of responses. If the children are merely

responding to the cultural conditioning necessary to keep them in conformity with the norms of the society in which they live, we must see culture as a set of guidelines that exists in order to be used by human beings (Leaf, 1972). Those of us who serve as teacher educators/trainers must interact with culture to change attitudes which are so essential to the cultural fabric of each society without doing harm to the children's standing within the family and the community.

It will take much more than legislation by governments to change the situation in schools and in the workplace.

There must be a fundamental change in attitude, particularly among women, so that they no longer see themselves merely as extensions of men. Young women must be taught to accept responsibility for their own future, not to use their sexual powers to attract someone who will spend his life treating them like helpless pets, as television and magazine advertising seem to encourage. The so-called "sexual revolution" mandating that sexual desires (usually stronger in males than in females) must never be denied, means that the girl who wants the attention of the male is expected to submit to his sexual desires,

to "prove that she loves him". If pregnancy is the result of the encounter, then that is the "reward" of the female as "boys will be boys". So many very young girls and women are having babies long before they are emotionally or financially ready for such responsibility and they often prove to be poorly prepared parents, many with little or no training in job skills and little hope for the future. Parents of these girls, sometimes themselves single mothers, the sole support of their families or forced to rely on public assistance, often neglect to teach their children about the awesome responsibility involved in sexual pro-

miscuity and childbearing and certainly are not able to provide the type of role model that the science/mathematics oriented female child would need in order to pursue her ambitions. The U.S. culture no longer imposes sanctions against the pregnant, unmarried female and continues to encourage immature males to "prove their manhood" as soon as possible. It is a rare female teenager who is encouraged, willing or able to buck the tide and to seek achievement of a goal of her own, unrelated to the males in her society. Even middle-class mothers often seem to rush their daughters into adult responsibility and sexual dependence by over emphasizing the social aspects of school—such as a kindergartner's mother who ignored the drawing she brought home and only seemed interested in whether or not she had a "boyfriend".

If this cultural attitude is, as the writer contends, a major contributing factor to the lack of interest by females in science and mathematics in this country, how much more so is it in countries where women in the workplace would only provide a threat to males? A case in point is Kenya where the traditional role of women is subservience to males and for a woman to aspire to a career in anything, especially something considered

so "MALE" as science, is for her to become a pariah, even among families where the father is highly educated. Mothers are horrified if their bright daughters express interest in anything unrelated to home and family.

What, then, are the long—and short—term solutions to the problem of gender bias, especially in the areas of science and mathematics? Katherine Hanson, in a 1993 report on Urban Education, wrote, "With a broader understanding of this cultural context... educators can begin to consciously change the culture to better respond to the educational needs of girls..." The first step has already been taken in the USA. The American Association of University Women has helped raise awareness and give voice to the unspoken in its "Initiative for Educational Equity" (1991). Government has waved its magic wand and thrown thousands of dollars at the problem (HR 1793, The Gender Equity in Education Act, provisions were accepted as amendments to the Elementary and Secondary Education Act in February of 1994 and the bill was passed by the House on March 24, 1994).

Teacher education programs in higher education are ever so slowly gearing up for yet another challenge to the old curricular ideas and integrating into their programs both a multi-cultural and a

gender awareness so that the new generation of teachers will be able to shed their own biases and give equal intellectual stimulation to both male and female students as well as those from differing cultural and ethnic backgrounds. Judith Kleinfeld (1995, v.), aptly sums up the views of the author of this paper, saying in part, "We may all believe that boys and girls should be treated equally... we find that we do not agree on what equal treatment means... Teachers must be sensitive not only to gender but also to students' cultural and economic backgrounds... teachers may believe in gender equity, but many families give boys precedence...". What, then, is the role of culture? What responsibility has the parent and what falls upon the teacher in making education equitable in both quality and direction? What is the mission of teacher training institutions in the area of gender equity?

Probably the primary role of teacher educators should be to change what attitudes can be changed and raise the awareness of both practicing and pre-service teachers so that they, in turn, can help parents rear a generation of girls and boys who are all cognizant of their intellectual and career potential within the cultural constraints of their own society. ♦

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