Recognition of Women's Psychological Development in Engineering Education

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The role of an educator is to be both intellectually challenging to and personally supportive of students. The statement applies to all levels of education, although the degree of challenge and the degree of support vary at different levels. Those of us teaching in engineering tend to focus on the intellectual challenge part of our role and rarely focus on the support that students reasonably expect us to provide. Further, most of us in academia are good at generalizing the theorizing, but it seems likely that we generalize too much from our own individual experiences in the educational system. It is likely that many of our students are different from us in important ways (although we clearly also share many similarities). One important difference is gender; all of us teach (some) students of the opposite gender. Understanding the ramifications of that difference is valuable. The purpose of this paper is to investigate some areas of psychological and developmental theory (i.e., to listen to voices of people who have generalized in those fields) and attempt to apply them to a philosophy of education in environmental and water resources engineering. In particular, some aspects of women's psychological development are investigated. These thoughts might make us re-evaluate the intellectual challenges and personal support we provide students.

Theory of Women's Psychological Development and Opportunities for Environmental and Water Resources Engineering

The percentage of women entering environmental and water resources engineering is generally higher than it has been in the past and also generally higher than in other fields of engineering. In our graduate program at the University of Texas, for example, 30% (11 of 37) of the students beginning the graduate program this fall are female; that percentage has risen gradually from less than 20% a decade ago. Most of us think of these trends as positive for our field. However, if we are to take advantage of these positive trends and continue them into the future, we likely will need to make a significant effort in understanding and using developments in the psychology of women.

A dramatic advance in this understanding came from Gilligan's theory of psychological development, set forth primarily in her book, In a Different Voice (Gilligan, 1982). It must first be noted that the book does not divide psychological development absolutely along gender lines, but notes that, predominantly, men and women develop and learn in different patterns. We might think of this as overlapping curves on a spectrum reflecting ways of thinking, acting, speaking, etc., but these curves have recognizably different means for men and women. No simple test based on Gilligan's theory that could allow us to test for "statistically significant" differences yet exists, but her theory has gained wide acceptance, especially among those who have emphasized the study of women. In what follows, the terms "male" and "female" or "men" and "women" are used to note these differences, but it is recognized that the differences do not follow gender lines in every case and that each of us, regardless of gender, has some of the tendencies of both. Nevertheless, the distinctions are valuable. Before Gilligan's work, the dominant theories of psychological development had been set forth not only primarily by male psychologists but had been based on studies using primarily male subjects. The voices of women and their experiences as women thus had been excluded in understanding human development.

Perhaps the key difference between the male tendency and the female tendency, according to Gilligan, is expressed in two words: separation and connection. Males tend to develop by, think about, and be rewarded for separation; females tend to develop by and think about making connections. These differences in the approach to learning and to decision-making are generally unrecognized in all of society, but, in male-dominated fields like engineering, the problem is acute.

Separation and connection form a spectrum; opportunities to observe ourselves and others on that spectrum abound in our daily professional lives. In a seminar discussion of a paper or certain experimental results, for example, one student might propose a certain interpretation. Two other students, one male and one female who fit the "means" on Gilligan's scale, might have very similar thoughts in response, but their stated responses might sound quite different. The male would tend to state what he disagreed with in the first student's interpretation and ignore areas of agreement; he might revel in the disagreement, the intellectual competition, the separation. The female would tend to state what she agreed with in the first student's interpretation and be more tentative in stating the disagreement; she would try to connect herself with the first student. We might ask ourselves how we respond to and reward these two students

(who had virtually identical thoughts). I believe the tendency of most professors, certainly the male professors but perhaps also the female professors who are well-schooled in academic traditions, would be to reward the male student more.

Desjardins (1989) considered the implications of Gilligan's "Different Voice" for higher education. Of particular interest is her assault on the theory of assimilation; i.e., she argues that trying to increase the numbers of women in non-traditional fields without changing the ground rules for success is bound to fail. To require women to become "autonomous, separate, and competitive" is a male approach and far less desirable than recognizing the value of connection and caring that characterizes the female approach. She states these ideas quite provocatively:

> "...assimilation at the expense of femaleness becomes not only undesirable but a kind of death. In denying an important part of themselves—that is, the caring, intuitive feminine part, and trying to become like men—women may instead develop a kind of hollowness that comes from being half a person which may, in fact, feel like a kind of personal death." (Desjardins, p. 140)

It might be added that the same concept could be said of men; our engineering educational system tends to "kill" the "feminine" traits not only in women but in men.

Harris et al. (1989) directly addressed the issues of educating women in science and engineering. They suggested that changes in pedagogy from the traditional hierarchical, competitive style to a nonhierarchical, egalitarian one can have a profound effect on all students, but the change is particularly important for women. Interactive and cooperative approaches to classroom teaching, assignments, research advising are surely better for everyone, but they will make a more dramatic change in the satisfaction of women.

The fact that the environmental and water resources engineering field attracts more women than most other branches of engineering seems related directly to the perception that it is a field that can make a difference in society. In essence, our field is perceived as one that is caring and connected to society. Part of its scientific basis, ecology, indeed is the study of connectedness. A challenge that faces us more than those in most fields is to gear our education, at least in style and perhaps ultimately in content, to the education of women. We must be leaders in learning how best to educate women in engineering. Because the overwhelming majority of professors are men, we cannot sit idly by and hope that the few women professors will be able to create the environment in our programs that maximizes women's learning.

This paper started with the thesis that the role of an educator is to be both intellectually challenging and personally supportive of students. Recognizing that gender-based differences are real, recognizable, and valuable to engineering is an important backdrop for what we can accomplish in our programs. Creating a more supportive environment for students will enhance the education we provide. Students will be more productive during their tenure in our programs, become better engineers in practice, and probably be more likely to recommend our programs to others. We as faculty will also benefit by such changes in several ways, including, perhaps ironically, the ability to be more intellectually challenging. While these changes are likely to have a more dramatic effect on women than men in our programs, all will benefit. The point here is not to propose the replacement of a male paradigm with a female one, but to suggest that a fully human one will recognize aspects of both paradigms and create a better environment for the education of all students.

References

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Author Tagline.

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