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A Profile of Women Scientists In Colleges of Agriculture

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The representation of women in the scientific and engineering professions has been low, and the agricultural sciences have been particularly difficult areas for women to enter. In 1984, Vetter found high unemployment rates for women in the agricultural sciences at all degree levels. Specifically, in colleges of agriculture, the representation of women among agricultural scientists is low. Currently, women agricultural scientists at the 70 U.S. land grant universities comprise 4.6% of the total agricultural faculty (Henderson & Cooper, 1987).

A recent study (Henderson & Cooper, 1987) provided information on the numbers of women faculty in U.S. land grant colleges of agriculture. Seventy percent of the colleges have between one and 20 women agricultural scientists. The highest number of women agricultural scientists employed in any one college is 27. In relation to the total population of women agricultural scientists, the crop and soil science discipline has the highest number of women scientists (19%). The agricultural engineering discipline has the fewest number of women scientists (1%). There is, additionally, a low representation of women agricultural scientists in all geographic regions of the U.S.

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More women are pursuing degrees in science, and these graduates constitute the youngest, more-recently trained scientists in their disciplines (Hornig, 1984). However, little is known about the professional characteristics and responsibilities of women scientists working in an academic setting. Most current research examines sex discrimination, sex role stereotypes, and sex biases (Butler & Marzone, 1980). However, Dresselhaus (1984), stresses the importance of studying the responsibilities of women scientists. Specifically, she studied the responsibilities of women faculty in engineering schools. At the same time, with regard to women in the agricultural sciences at universities, little descriptive information is available.

Purpose of the Study

This research effort was the first national study to focus specifically on women agricultural scientists in academic settings. The main purpose of the study was to characterize women scientists in colleges of agriculture at the 70 land grant universities in the United States. Specifically, the study of women agricultural scientists was designed to investigate the following research objectives:

(1) to describe their academic background and current positions;
(2) to describe their teaching, research, and service responsibilities; and
(3) to provide demographic data.

Methodology

For purposes of this study, women agricultural scientists were defined as faculty members with academic, tenure-accruing appointments in the following agricultural disciplines: animal science, crop and soil science, agricultural economics/rural sociology, agricultural engineering, natural resources/-forestry, biological sciences, horticulture, agricultural and extension education, and food science/animal nutrition.

To develop a comprehensive list, associate deans in colleges of agriculture at land grant universities were asked to provide the names of women scientists with academic, tenure-accruing appointments in their colleges of agriculture for the 1985-86 academic year. A 100% response rate from the deans was achieved and resulted in a list of 514 women faculty in the agricultural sciences.

Stratified random sampling techniques incorporating the 70 land grant universities were employed to obtain a representative sample of 218 women scientists (Cochran, 1977). This technique insured faculty representation from each land grant university that reported having women agricultural faculty.

A research questionnaire was designed specifically for use in this study. The questionnaire had five sections: educational and professional background, job responsibilities, career perceptions, self-perceptions, and personal data. Both open- and close-ended questions were used to gather the research data.

Content validity of the questionnaire was established by a panel of experts consisting of agricultural education faculty, college administrators, and women scientists in the biological/physical sciences of The Ohio State University. A pilot test was conducted among women faculty in engineering and the physical sciences at The Ohio State University. Reliability coefficients (Cronbach's alpha) of .71 to .90 were obtained for the Likert-type scales used in the questionnaire.

During the first week of April 1986, a cover letter, questionnaire, and self-addressed, stamped envelope were mailed to the women scientists in the sample. A second mailing of the questionnaire was sent to all non-respondents during the first week of May 1986. The third and final mailing of the research questionnaire was sent during the fourth week of May 1986. Usable questionnaires were returned by 157 women scientists resulting in a 72% response rate. The responding sample included women agricultural scientists from 52 land grant universities throughout the United States.

The returned questionnaires were divided into two groups, those responding before and those responding after the third follow-up letter. The two groups were compared statistically to determine whether early respondents were different from late respondents. Based on a Chi-square test for independence, early respondents appear to be no different from late respondents on the variables included in the study. Assuming that late respondents are like non-respondents (Miller & Smith, 1983), the results of the study were generalized to the population.

Findings

The findings provide a profile of women agricultural scientists regarding: a) their professional characteristics, b) their job responsibilities, and c) personal characteristics.

Academic Background

The 157 women represented all nine academic disciplines. Twenty-three percent of the women were faculty members in the crop and soil science discipline, 15% were in the animal sciences, 14% in horticulture, 12% in agricultural economics/rural sociology, 12% in the food science/animal nutrition, 12% in the biological sciences, 8% in natural resources/forestry, 3% in agricultural and extension education, and 1% in agricultural engineering. Nine out of ten women faculty have a doctoral degree. The data reveal that one half (52%) of the women faculty are assistant professors, 32% are associate professors and 16% are full professors. The women in the responding sample have been in their current position for an average of five years, although the range is from one year to 31 years. Fifty percent of the women have been in their current positions for three years or less. Forty-six percent of the women indicate that they have tenure and that receiving tenure had taken an average of six years. Over two-thirds (70%) of the women are on 12-month academic appointments. The women indicate that they work in academic departments with an average of 24 faculty members. They also report an average of three women faculty per department. Thirty-five percent of the women reported that they are the sole women in their department.

Teaching, Research, and Service Responsibilities

Forty-nine percent of the women indicated that they teach neither undergraduate nor graduate courses. The women faculty with teaching responsibilities teach an average of one undergraduate and one graduate course per year. They spend an average of seven hours per week in preparation for teaching and devote a total of nine hours per week to lecture, laboratory, and supervision responsibilities. The women have an average of seven undergraduate advisees and are the major adviser for one masters student and one doctoral candidate. However, 44% of the women reported that they had no undergraduate advisees, 37% have no masters students, and 48% have no doctoral candidates.

The women scientists indicated that they are currently conducting an average of three research projects in addition to directing graduate student research and have directed an average of three funded research projects during the past five years. Only 9% of the women were not currently involved in a research project. Eighty-eight percent of the women have published refereed journal articles during the past five

years. The women have published an average of seven journal articles during the five-year period. They have presented an average of seven papers at professional meetings during the last five years and have written an average of one book chapter and three research bulletins. Twelve percent of the women in the sample have written a textbook.

In response to questions about membership on committees, the women reported that they serve on an average of three departmental, one college and one university committee. One third (33%) of the women stated that they do not serve on any college committees, and 46% serve on no university committees. Forty-seven percent of the women hold leadership positions on departmental committees. Seventeen percent report that they hold leadership positions on college committees, and 12% have a leadership role on university committees. On the average, the women scientists are members of two state, four national, and one international professional organization. Twenty-three percent of the women hold leadership positions in state organizations, 29% have a position of leadership in national organizations, and 7% have a leadership position in international organizations.

Twenty-two percent of the women responded that they are a faculty adviser for a campus student organization. They reported that the average number of students involved in those organizations is 55. Forty-eight percent of the women advisers rated their level of responsibilities to those organizations as low (one hour or less per week).

Personal Characteristics

Demographic data were collected on the sample of women agricultural scientists. The average age of the women was 39 years, with a range of 27 to 67 years. Ninety-five percent of the women scientists were white, non-Hispanic. Eighty-one percent of the women had a salary between $30,000 and $44,999. Only 8% of the women earned less than $30,000. Two of the women earned more than $60,000 per year in non-administrative positions. One woman who earns more than $60,000 is a professor of agricultural economics, and the other is an associate professor of agricultural economics at a different university. Sixty percent of the women are married, and 42% have children. The average number of children is two. Twenty-seven percent of the women scientists have never been married. Over one half (52%) of the women were raised in a metropolitan area, while 16% spent their childhood on a farm. Three-fourths of the women indicated that they had not participated in any agricultural youth organizations, while 20% responded that they had been in 4-H.

Discussion

An analysis of these data presents a clear profile of the women working today in the agricultural sciences at U.S. land grant universities. The typical woman agricultural scientist in this sample is white, in her thirties, married, raised in a metropolitan setting, and earns between $30,000 to $45,000 a year. The woman agricultural scientist of today has her doctorate. If she has tenure, she received it in six years. She is just as likely to teach undergraduate and graduate courses as not to teach at all. Presently, she is conducting three research projects and has directed an average of three funded projects in the last five years. Also, during that time, the average woman agricultural scientist has published seven refereed journal articles and has presented seven papers at professional meetings. She is likely to serve in a leadership position on departmental committees but not on college or university committees.

This profile of the woman agricultural scientist gives meaning to the available statistical data. While women may be under-represented on college of agriculture faculties, they do represent a young, dynamic, and successful group of scientists on those faculties. This profile will be meaningful to agricultural administrators in understanding the demographics of their own faculty and of college of agriculture faculties nationwide. More importantly, this profile will be meaningful to agricultural administrators in understanding the demographics of their own faculty and of college of agriculture faculties nationwide. More importantly, this profile will be meaningful to the 4.6% women on agricultural faculties in U.S. land grant universities. Many of these women serve in departments in which they are the only woman. In this profile, they will recognize themselves and learn about their colleagues across the country.

Recent statistics from the U.S. Department of Agriculture show that there is room for women in agricultural fields (Coulter, Stanton & Goecker, 1985). These data indicate that there are more employment opportunities for agricultural scientists and engineers than there are graduates available for those jobs.

Another research organization, however, has issued a warning about employment opportunities for women in the sciences. In a recent issue of *Mosaic*, the publication of the National Science Foundation, Betty Vetter states that opportunities for women in the sciences may have reached their peak and will now begin to drop significantly (Vetter, 1987). Furthermore, Vetter says that the professional community of scientists and engineers has done little to welcome women into its fraternity.

If women are to maintain what advancement they have made in the sciences, recruitment and retention of young women into science and agriculture must become a high priority. Much current research describes the development of and factors affecting girls' attitudes about science and scientific careers. Specifically, researchers cite the importance of teachers', counselors', and parents' attitudes toward science classwork as being crucial factors affecting girls' perceptions of science (Matyas, 1985). Case studies show that teachers, using unique instructional materials or techniques, are highly successful in en-

couraging girls in school to become women in science (Kahle, 1985). Clearly, awareness of the possibilities available in scientific careers is the essential first step in recruiting and retaining women in the agricultural sciences.

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7 Strategies for Improving Instruction

James Knight

Introduction

Colleges of agriculture have had a long standing commitment to the improvement of instruction in their various institutions. In addition, the National Association of College and Teachers of Agriculture (NACTA) has had instructional improvement as one of its major missions. With such strong commitments, the recent and substantive research and literature base which has been developed in the areas of teaching effectiveness and student achievement would appear to provide important information for teachers and administrators with responsibilities for instruction in colleges of agriculture. The purpose of this paper is to present seven strategies for instructional improvement which have grown out of that related research and literature. The items presented in this article do not represent an exhaustive list of strategies but rather a selection of those strategies which appear to have the strongest and most consistent support in the literature.

Psychological Basis

In reviewing the work of Goodlad (1984), Boyer (1983), Sizer (1984), Adler (1982), Glasser (1986), Rosenshine and Furst (1971), Good, Brophy as well as Purkey (1978), plus most others who have done research and written broadly in the field of teaching effectiveness, it is clear that there are at least two major psychological notions that underpin all that has been identified as enhancing instructional effectiveness. The Pygmalion Effect or self-fulfilling prophecy and the power of self image or self concept pervades and indeed seems to be inextricably interwoven into the entire fabric of the research and literature in this field.

The Pygmalion Effect or self-fulfilling prophecy basically holds that people tend to live "up to" or "down to" what others expect of them. Rosenthal and Jacobson (1968), social psychologists at Harvard, convinced a number of teachers that a test they would give would predict students who were about to experience a sudden burst in learning without any extra effort on the part of the teachers. After the test was administered, one-fifth of the students were selected at random. The list of names of the randomly selected students were given to the teachers as the "educational bloomers" identified by the test. Eight months later when the students were tested again, it was found that the identified students had actually bloomed. They gained an average of four points in I.Q. above the control group. However, the real difference between the two groups of students rested primarily in the perceptions of the teachers. That is a self-fulfilling prophecy. While Rosenthal and Jacobson's study has been severely challenged because of methodological concerns, succeeding efforts where those flaws were corrected have still found similar results (Purkey 1978, Good and Brophy 1984). It appears that this concept or notion "holds water."

How students perceive (self image) and feel (self esteem) about themselves will influence their behavior as well as their achievement. If students see themselves as productive, valuable and worthwhile, they tend to

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