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ABSTRACT

The Visiting Professorship for Women (VPW) program was initiated by the National Science Foundation (NSF) in 1982 to address the under representation of women in science. This summary which draws on a study completed in 1993 considers the effects of the VPW program and the nature of the participants. Both strengths and limitations of the existing program are highlighted. The study employed both quantitative and qualitative methods, using surveys with closed- and open-ended items. Responses to the open-ended items were extensively analyzed through the "Ethnograph" computer program to yield a set of qualitative data for analysis. Short case studies were conducted with eight of the awardees to confirm the findings and add richness to the study. The study focused on the 233 women receiving VPW awards between 1982 and 1990. The findings address profiles of participants, career barriers and facilitators, experiences of participants, and program impacts. Using traditional indicators of academic promotion and generation of publications, the VPW awardees were found to be highly successful and there is compelling evidence to suggest that VPW made a significant contribution to the success of the awardees. (LZ)

The Visiting Professorships for Women Program: Lowering the Hurdles for Women in Science and Engineering

NSF SUMMARY AND COMMENTS

Sponsored by the National Science Foundation
Conducted by SRI International, Menlo Park, California

RED - sponsored Evaluation

National Science Foundation
Directorate for Education and Human Resources

The Visiting Professorships for Women Program: Lowering the Hurdles for Women in Science and Engineering

NSF SUMMARY AND COMMENTS

APRIL 1994

Based on a study prepared for the National Science Foundation by SI
Only a portion of the findings from the original could be included in
The full report, No. 93-159, is available from the National Science F
Wilson Boulevard, Arlington, VA 22230. The program officer for
Conrad Katzenmeyer, Division of Research, Evaluation and Disse
and Human Resources Directorate, NSF.

OVERVIEW

In 1992, SRI International was awarded a contract to conduct an evaluation of the National Science Foundation's Visiting Professorships for Women program. This is an agency summary of that study, which was completed in 1993.* Findings, tables, and text from the original report have been drawn on in this summary. However, the conclusions are those of NSF, unless otherwise indicated.

The limited number of women with doctorates in mathematics, science, and engineering has been well documented. In 1989, 40% of bachelor' s degrees in science and engineering were conferred on women, whereas only 31% of master' s degrees and 28% of doctorates were awarded to women. Although there has been some increase in the percentages of women attaining advanced degrees in these fields, a substantial gap remains between men and women, particularly in the physical sciences, engineering, and mathematics. Figure 1 provides a breakdown of postsecondary students by gender and field.

The report also notes that women have had difficulty advancing their careers in these fields. Some of this difficulty is due to the availability of fewer female role models in the sciences and engineering and the resistance encountered in trying to excel in male-dominated fields. Family responsibilities have also made women's roles especially taxing, particularly in academia, where tenure and promotion decisions often coincide with these demands.

The Visiting Professorships for Women (VPW) program was initiated by NSF in 1982 to address the underrepresentation of women in science. The program, which is administered as a competitive grant program, provides women with the opportunity to serve as visiting professors at host universities of their choice plus funding to cover their usual salary and other expenses. In return, VPW awardees are required to carry out their proposed research and be involved in lecturing, counseling, and other activities with students. The objectives of the program are:

- To provide opportunities for advancement of outstanding women in engineering and in the disciplines of science supported by NSF.
- To encourage female students to pursue careers in science and engineering by providing greater visibility for women scientists and engineers in industry, government, and academic institutions.

To receive a VPW award, applicants must demonstrate a level of research performance equal to that required for regular NSF research grants. The VPW proposal differs from other NSF grant proposals only in that applicants must also include interactive activities that involve teaching, mentoring, and other student contacts. Approximately 30% of the award period must be devoted to the interactive activities. Awards are from 6 months to 36 months.

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* Ruskus, J., and Williamson, C. (1993). The Visiting Professorships for Women Program: Lowering the Hurdles for Women in Science and Engineering. Washington, DC: U.S. Government Printing Office (NSF 93-159).

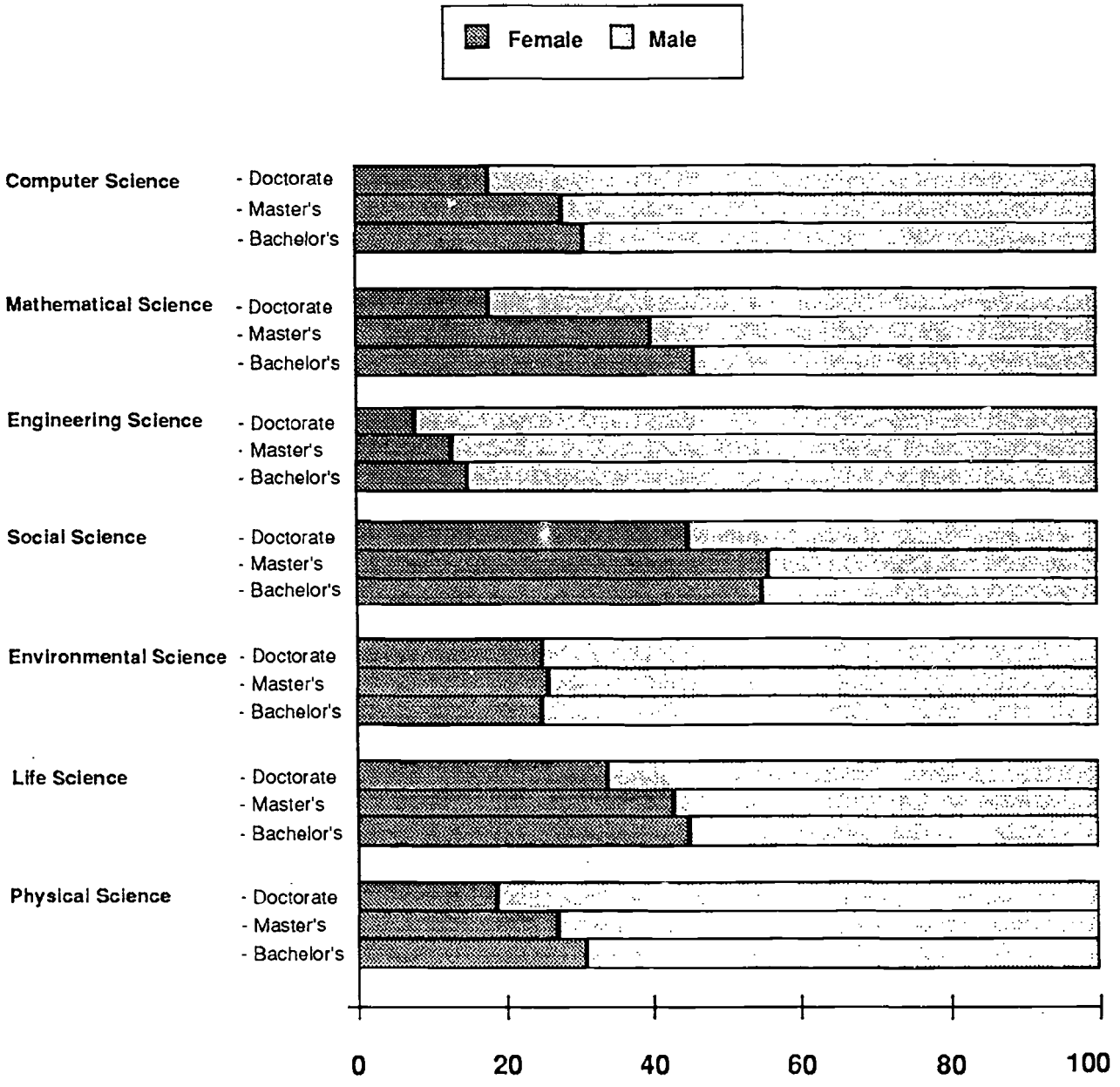

FIGURE 1 PERCENTAGE DISTRIBUTION OF FEMALE AND MALE POSTSECONDARY EDUCATION STUDENTS IN 1989, BY LEVEL AND FIELD OF STUDY

From 1982 to 1992, NSF awarded VPW grants to 280 women. Approximately 100 women applied each year, and of these 28.6% received awards. From 1982 to1, 8 1990% of these awards were from $50,000 to $150,000, including home and host institution contributions. In 1992, the size of award increased to an average of $173,000. Awards are made to the host institution, which is eligible to receive research indirect costs. Both home and host institutions are encouraged to provide cost-sharing.

SUMMARY OF THE SRI INTERNATIONAL STUDY

Study Design

The study provided a broad view of the program and participants. The questions addressed were:

- What barriers and facilitators to career advancement do women scientists perceive?
- Who applies to VPW? Who is awarded a VPW?
- What are the experiences of recipients?
- What impacts result from the award?

The study employed both quantitative and qualitative methods, using surveys with closed- and open-ended items. Responses to the open-ended items were extensively analyzed through the *Ethnograph* computer program to yield a set of qualitative data for analysis. Short case studies were conducted with eight of the awardees to confirm the findings and add richness to the study.

The study focused on the 233 women receiving VPW awards between 1982 and 1990. In addition, 340 women sampled from 604 VPW declinees were surveyed from the same period, as were 340 of 2,768 other NSF female grant recipients. Women falling into more than one group were assigned to the VPW awardee category when appropriate (e.g., women who had been declined a VPW award and subsequently received an award were treated as awardees) or to the VPW declinee category. Response rates were 81%, 73%, and 82%, respectively, for an overall rate of 79%. Samples were weighted to adjust for differential sampling rates and nonresponse when reported together.

Separate surveys were prepared for the three groups, with common items as appropriate. Questions were developed through focus groups conducted with 27 women from the study population, representing all three groups.

The reader needs to consider the nature of this evaluation as well as the types of comparisons that could be made. SRI was charged to look at the effects of the VPW program and the nature of the participants. Strengths and limitations of the existing program were emphasized. SRI was

not charged to examine alternative program structures or to address whether there are ways other than VPW to attain broad program objectives.

The comparison groups selected were appropriate, but necessarily presented some limitations. It is expected that awardees would be compared with declinees to give some indication of the impact of an award. However, selection criteria are likely to be correlated with outcome measures; those who are selected for awards may already be more successful in their careers. Comparisons with female NSF grantees overall must also be viewed with care because the goals of the VPW program are broader and may well draw applicants with different goals.

Findings

Profile of Participants

The women who had applied to VPW were an average age of 39.7 years, over 90% were white, over half were married, and over 60% had no children below the age of 18. They had held their highest degree an average of 9.6 years. Almost 90% were employed at academic institutions; of these women, 75% were employed at institutions other than the top 25 research universities. Awardees were slightly older than declinees (41.2 vs. 39.1 years), had held their degrees longer (12.2 vs. 8.6 years), and were more often in tenured positions (65% vs. 41%), which would suggest that professional maturity plays a role in receiving a VPW award.

One finding is notable regarding the three study groups. These women were more likely to be from physical science, environmental science, engineering, math, and computer science than female scientists and engineers in general. Breakdowns of the research fields of awardees versus declinees and the three groups as a whole versus the broader population of employed female doctoral scientists and engineers are presented in Figures 2 and 3.

Career Barriers and Facilitators

According to qualitative analyses of the open-ended questions regarding barriers and facilitators in their careers, the three groups, taken as a whole, mentioned the factors listed in Tables 1 and 2 most often.

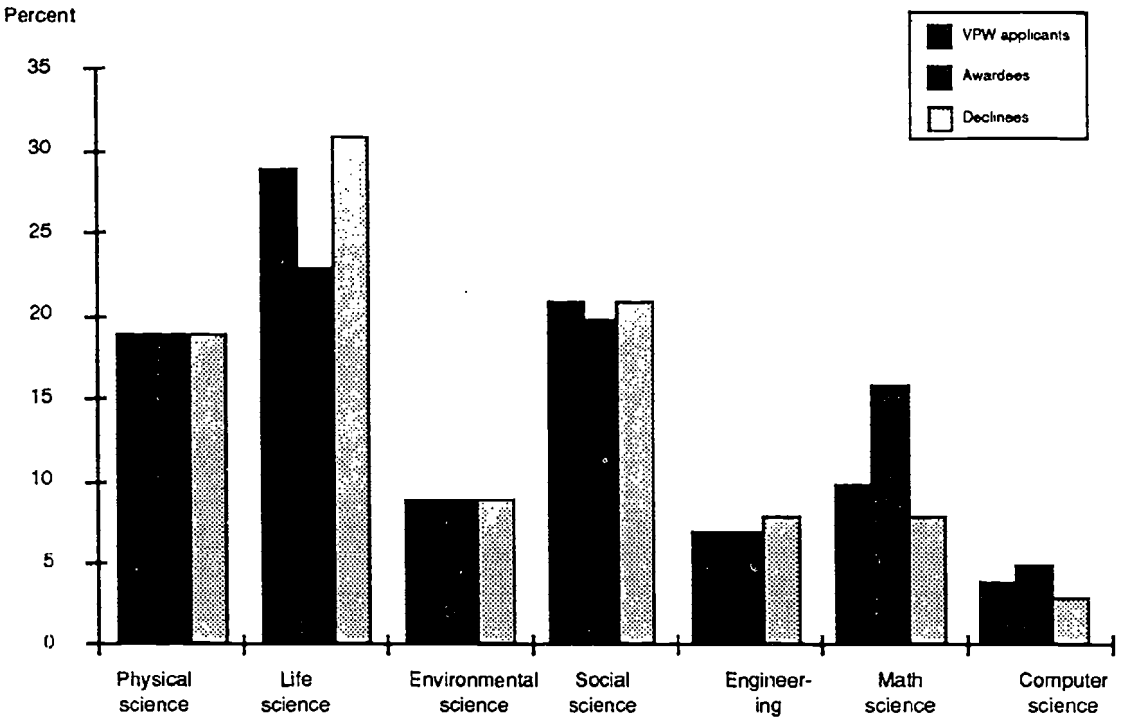

FIGURE 2 PERCENTAGE OF VPW APPLICANTS, BY FIELD OF RESEARCH AT TIME OF APPLICATION

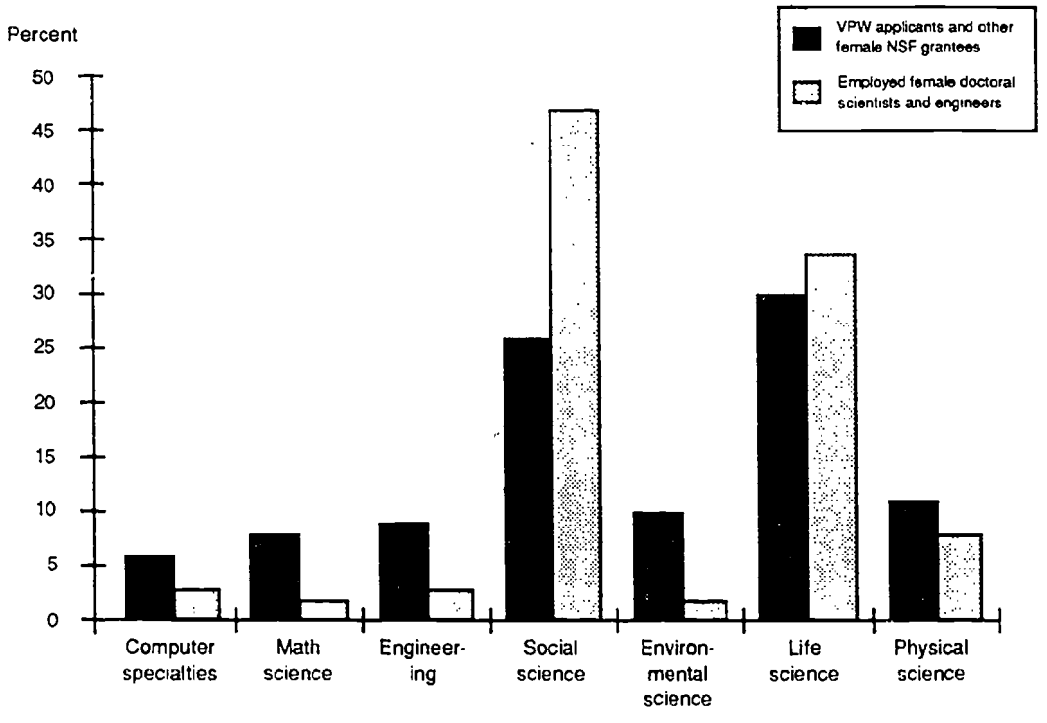

FIGURE 3 CURRENT (1993) FIELD OF RESEARCH

Table 1

PERCENTAGE REPORTING CAREER BARRIERS
(Total n=3,605)

Gender discrimination	41
Personal life circumstances	33
Lack of support resources	31
Lack of funding	18
Lack of professional support	14
Other barriers	21

These general themes include specific types of barriers. Gender discrimination often represented problems of attempting to achieve in fields where women are not perceived as equally competent. However, there were also instances of perceived institutional discrimination in hiring and promotion. Personal life circumstances often addressed marriage and children, with the woman required to undertake a larger share of the burden. Two-career marriages also presented problems, with the woman often being the junior professional and thus having fewer professional opportunities.

Lack of support resources referred to space, equipment, and assistants for their research. Time was also an issue as women report greater demands to participate on committees and carry out administrative functions. Lack of research funds was also considered a problem; women felt that the review process was driven by an "old-boy" network, and that they had less time to develop high-quality proposals.

Lack of personal support often was linked to limited opportunities for mentoring and lack of role models. These women also felt a lack of professional contacts and a sense of isolation from their colleagues. Under other barriers, low self-confidence was the problem cited most frequently.

Table 2

PERCENTAGE REPORTING CAREER FACILITATORS
(Total n=3,605)

Professional support networks	58
Internal strength and motivation	41
Funding agency support	26
Personal support systems	22
Support resources	17
Other sources of assistance	9

Three of the sources of barriers to career advancement—professional support, funding, and support resources—were also cited as facilitators. The most important facilitator cited was professional support, with many women noting the importance of colleagues' encouragement. Some of this support came from male colleagues, although these women noted the importance of support from other women and women' s networks. Internal motivation was also cited as a critical facilitator by many women.

More women cited funding as a source of support than as a barrier (26% vs. 18%). Research funding was considered important at critical times in their career, such as when they were just beginning or when family responsibilities were high, permitting them greater flexibility. Personal support systems were also deemed of great importance. Husbands, family, friends, and colleagues provided key emotional support and encouragement.

Some women also found support resources to be of importance to their careers. Availability of good students and institutional support were mentioned most often in this category.

Taken as a whole, the women in this study identified a substantial number of barriers as well as facilitators. Although many undoubtedly apply to males as well as females, there is a clear pattern of needs identified that justify special emphasis on women scientists and engineers, such as the VPW program.

Experiences of VPW Awardees

Over half of the awardees spent their visiting professorships at research universities ranked among the top 25. The host department in many instances had few females, with the smallest proportions in physical and mathematical sciences. Awardees were able to devote much more time to research than they had in their home institutions (61% vs. 36%). Time spent on teaching and administration was proportionately less, while contact with students was approximately the same. Time distributions at home and host institutions are given in Figure 4.

The most common ways of working with students were acting as a mentor, collaborating on research, and providing academic advising. VPW awardees mentored more female than male students (5.0 females vs. 3.7 males).

VPW awardees' work with colleagues was most often research collaboration, collaboration on publications, and co-teaching. Collaboration with male colleagues was more frequent than with females (4 to 1). However, given the small number of women in many of these departments, VPW awardee's collaboration occurred proportionately more often with females.

On the basis of these data, it can be concluded that the awardees were having the types of experiences the VPW program intended and that students and others at the host institutions interacted with the visiting professors. Thus, the program has been implemented as planned.

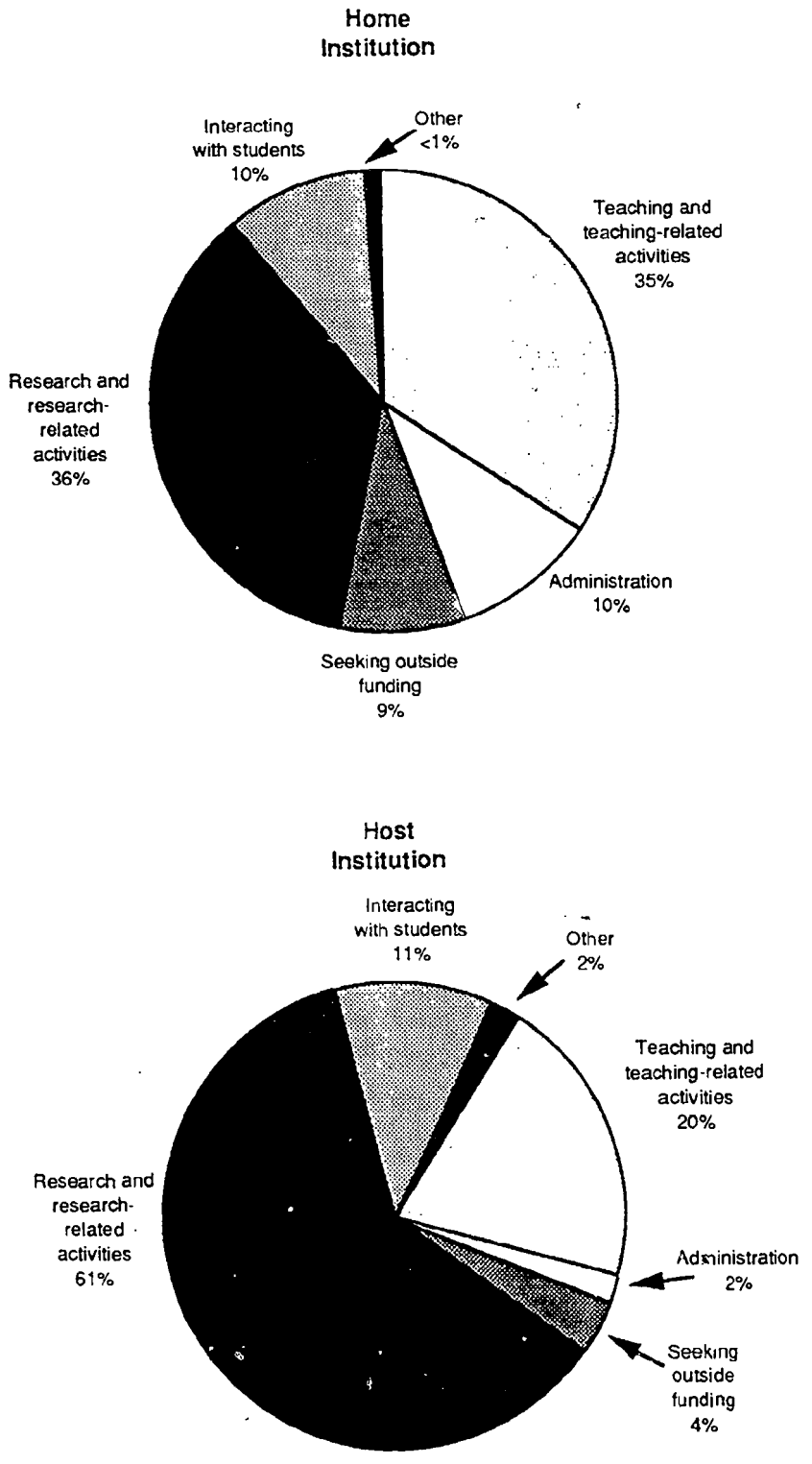

FIGURE 4 AVERAGE PERCENTAGE OF TIME SPENT ON VARIOUS ACTIVITIES BY VPW AWARDEES AT THE HOME AND HOST INSTITUTIONS

Program Impacts

Almost two-thirds of the VPW awardees were very satisfied with their experience at the host institution overall, while 30% were somewhat satisfied (only 4% each were somewhat or very dissatisfied). Areas of greatest satisfaction were time available for conducting research, workload at the host institution, and quality of colleagues in the host department. Areas of least satisfaction were treatment by the administration of the host department and availability of support services and equipment. These results are detailed in Table 3.

Table 3

SATISFACTION OF VPW AWARDEES WITH THEIR VISITING PROFESSORSHIPS

Aspect	Percent Very Satisfied	Percent Somewhat Satisfied or Dissatisfied	Percent Very Dissatisfied	Number of Respondents
Experience at the institution overall	62	34	4	171
Time available for conducting research	84	16	0	173
Workload while at the host institution	80	19	1	168
Quality of colleagues in the host department	73	26	2	171
Time available for interacting with students	67	33	1	171
Quality of research facilities and support	58	38	4	167
Extent to which the host institution met its commitments as stated in the VPW application	55	40	5	174
The treatment received from colleagues of the host department	54	39	7	173
Research assistance received	46	48	6	141
The treatment received from the administration of the host department	43	45	11	175
Availability of support services and equipment (including clerical support, personal computers, etc.)	39	53	8	169

Qualitative analysis of open-ended items dealing with benefits and drawbacks of the program yielded the breakdowns in Tables 4 and 5.

Table 4

PERCENTAGE OF AWARDEES REPORTING VARIOUS TYPES OF VPW BENEFITS (Total n=189)

Research catalyst	66
Research competence	45
Career advancement	39
Expanded network	20
Benefit to others	14

Ninety-five percent of the awardees responded to the question about benefits of VPW. The categories of responses mentioned most often dealt with gains in their research programs. The VPW program was a research catalyst in providing the opportunity to improve the quality and theoretical grounding of their research by allowing them to focus on their research programs. VPW also allowed them to increase their research competence, both knowledge and skills, through experiences that were not available in their home institutions. Self-confidence was also improved.

Career advancement was cited by over a third of the awardees. This often took the form of greater recognition in their field and greater opportunities in their profession, but a number did point to VPW as a direct influence on tenure, promotion, changing positions, and other professional advancements. Their networks of professional colleagues were also expanded through contacts at the host institutions and through travel that occurred as a result of the VPW award. A number of awardees also mentioned benefits to others, such as students who often had access to an expanded support network through their contacts with the awardees.

Table 5

PERCENTAGE OF AWARDEES REPORTING VARIOUS TYPES OF VPW LIMITATIONS (Total n=189)

Personal costs	24
Nonsupportive host	18
"Women' s program"	11
Features of the VPW	9

Considerably fewer awardees cited program limitations than benefits. Personal difficulties encountered in moving, being separated from their families, and reestablishing their laboratories were mentioned. However, these were usually seen as necessary costs of this type of program.

Concerns were also raised about dealings with the host institution. Some awardees felt that they were not accepted by the host department or given the types of support that they had been led to believe they would receive. These problems were felt more acutely by women who had visiting professorships at the top 25 research universities.

A few of the awardees felt that others had reacted with some negativism to their VPW experience because the program was for women. For example, there were comments that it was less competitive than other awards and therefore of less value. Finally, a number of features of the program were cited as creating limitations, primarily dealing with the length of the award. There was the feeling that the amount of time spent at the host institution was too short for the awardee to establish herself.

Overall, the strong positive responses by the awardees indicate that they found the VPW experience to be highly valuable. Although some problems were expressed, most awardees found that the benefits outweighed any limitations. A summary of their ratings of the impact the VPW program had on them is given in Figure 5. Another analysis indicated some differences between awardees who visited the top 25 research universities and others, favoring the less prestigious institutions, but the absolute differences were quite small.

With regard to their impact on the host institution, 92% of the awardees felt that they had heightened student awareness of women's scientific contributions, and 85% felt that they had heightened faculty awareness of these contributions. Seventy-one percent felt that they had increased faculty awareness of the needs of female students. Two thirds (66%) felt that they had influenced the instructional program of the host institution, and 59% felt that they had influenced the research program.

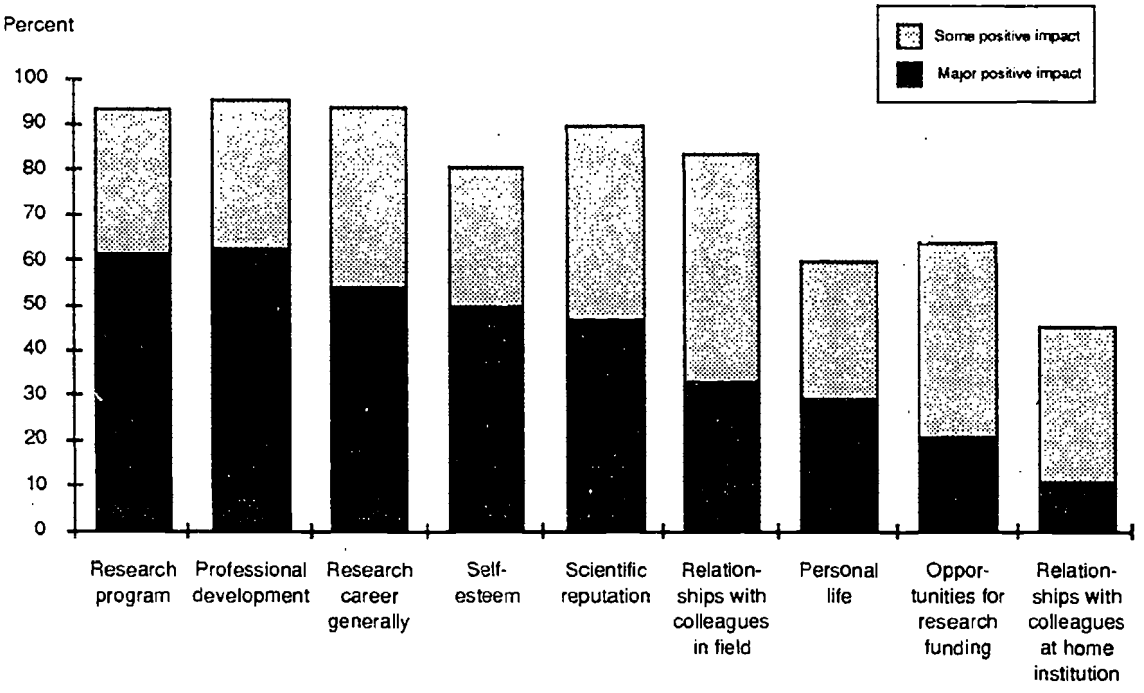

FIGURE 5 AWARDEES' RATINGS OF THE IMPACT OF PARTICIPATION IN THE VPW PROGRAM

Comparing the career progress of awardees and declinees after the VPW award period, both groups had made substantial gains. Many more were now tenured (82% for awardees and 67% for declinees, compared with 70% and 44%, respectively) and the numbers not on tenure track were lower (9% for awardees and 19% for declinees, compared with 16% and 28%, respectively). A summary of work-related changes is reported in Table 6.

In general, the advancements for declinees were greater than those for awardees, which is not surprising given that awardees were professionally more advanced at the time of their award. However, it is notable that 47% of awardees reported increasing their research, compared with 17% reporting a decrease, while 36% of declinees reported decreasing their research, compared with 31% indicating an increase. This would suggest that the VPW is having an impact on keeping awardees involved in research, while declinees are more likely to be moving to administrative and other non-research responsibilities.

Comparing awardees and declinees with other female NSF grantees, over three-quarters of VPW awardees were tenured, compared with about two-thirds of the other groups. Awardees were slightly more productive than female NSF grantees in generating publications over their careers (28.8 vs. 25.6); both were ahead of declinees (19.7). A summary of publication productivity is presented in Table 7. Female NSF grantees were more successful in obtaining awards and in size of awards received than either awardees or declinees.

In terms of job satisfaction, there were very few differences between the three groups. Awardees were more satisfied with job security than declinees or other female NSF grantees, which is not surprising given that a greater percentage of awardees was tenured. Declinees were less satisfied with salary and research assistance received, and female NSF grantees were more satisfied with teaching assistance received.

CONCLUSIONS

The Visiting Professorships for Women program is functioning as it was designed to do, providing worthwhile research experiences for the awardees and a source of mentoring and role modeling for students. The awardees highly value the experience, and almost half report an increase in their research efforts after their visiting professorship.

Whereas both awardees and declinees report substantial professional advancements following the period of the VPW award, about twice as many declinees report a decrease in research activity. This suggests that a VPW award comes at a critical time for keeping the recipient active in research as opposed to other academic, non-research responsibilities.

Table 6

PERCENTAGE OF VPW APPLICANTS WHO HAD WORK-RELATED CHANGES AFTER PARTICIPATION IN OR APPLICATION TO THE VPW PROGRAM

Type of Change That Occurred	Awardees (n=61-146)	Declinees (n=90-162)	Extent of VPW Contribution		
			Major	Some	None
Change from a non-tenure-track position to a tenure track position	27	29	—	—	—
Award of tenure status	32	35	—	—	—
Promotion in academic rank or to a more desirable position	58	66	41	46	13
Change from part-time to full-time employment	16	26	—	—	—
Decrease in the quality or level of institutional support (e.g., clerical support, office/lab space)*	11	28	—	—	—
Increase in time spent on research**	47	31	44	37	18
Decrease in time spent on research***	17	36	—	—	—
Transfer to an institution of lower quality	5	7	—	—	—
Transfer to an institution of equivalent quality	16	20	—	—	—
Transfer to an institution of higher quality	28	19	42	46	12

— Too few cases to report (n < 25).

* $\chi^2 = 11.042$, df = 1, n = 265, p < .01

** $\chi^2 = 8.020$, df = 1, n = 308, p < .01

*** $\chi^2 = 14.070$, df = 1, n = 296, p < .001

Table 7

DISTRIBUTION OF VPW APPLICANTS AND OTHER FEMALE NSF GRANTEES, BY NUMBER OF ARTICLES PUBLISHED IN REFEREED JOURNALS IN THE PAST 2 YEARS AND DURING CAREER

Number of Articles Published	Awardees (n=171-172)	Declinees (n=182-183)	Other Female NSF Grantees (n=260-261)
In the past 2 years*			
0	9%	19%	12%
1 to 2	19%	32%	27%
3 to 5	48%	34%	35%
More than 5	24%	15%	26%
Total	100%	100%	100%
Average number of articles	4.4	3.2	4.3
During career**			
Fewer than 10	16%	39%	30%
10 to 19	17%	21%	20%
20 to 29	27%	19%	19%
30 or more	40%	20%	32%
Total	100%	100%	100%
Average number of articles	28.8	19.7	25.6

* $c^2 = 23.788$, df = 6, n = 616, $p < 0.001$

** $c^2 = 31.469$, df = 6, n = 613, $p < 0.001$

Using traditional indicators of academic promotion and generation of publications, the VPW awardees are highly successful. Although it cannot be said for certain how much of this success is due to the VPW program because of initial differences between awardees and declinees, there is compelling evidence that VPW has made a significant contribution.

The evaluators also made additional observations regarding the VPW program. One issue they raised is whether the two objectives of the program—to provide opportunities for advancement and to encourage female students to pursue careers in science and engineering—may be in conflict. Their concern is that the program benefited junior awardees more than senior awardees in terms of career advancement, whereas senior awardees made better role models for female students than did junior awardees. SRI therefore suggested a two-tier program for junior and senior women. NSF concurs that there is some inherent conflict between the two objectives and should consider whether other mechanisms might be employed to assure appropriate balance.

SRI also commented on the problems that VPW awardees experience at their host institutions. SRI proposes providing information to host faculty about awardee needs and their commitments to awardees, monitoring the treatment of awardees, and creating a special session at the annual awardee meeting to discuss VPW awardees' experiences at host institutions. The first two recommendations are done to some degree by program staff at this time by sending letters to Department Chairs explaining program requirements and mediating disputes that might arise. NSF believes that further action is not warranted at this time. The recommendation to have a special session at awardee meetings appears both sensible and doable. Discussions by VPW awardees of their experiences have in fact been featured at the past several awardee meetings.

As another means of engaging the Departments, not suggested by SRI, NSF might also consider providing some direct support to host departments for costs associated with the VPW awardee. Although the host institution may receive indirect costs, this does not necessarily lead to any additional support for the host department, which incurs an increased administrative burden. Direct support might have greater leveraging power.

The final suggestion of SRI is to increase the funding for the VPW program. Analyses of funding levels for science, mathematics, engineering and technology education are done annually through the strategic planning process and are subsequently reflected in the budget request. This evaluation will certainly be considered as evidence in that process.

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