

*Faculty Early Career
Development (CAREER)
Program*

*External Evaluation
Summary Report*



Division of Research, Evaluation, and Communication
Directorate of Education and Human Resources
National Science Foundation

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Preface

This summary report is presented to the Division of Research, Evaluation and Communication of the National Science Foundation (NSF) in compliance with Contract No. REC-9452969 and REC-9912174.

From 1998 through 1999, Abt Associates conducted an evaluation of the first three years of the Faculty Early Career Development (CAREER) Program, including surveys of CAREER awardees, NSF-funded comparable faculty, and department chairpersons in departments housing CAREER awardees. We would like to thank the survey respondents for their time and cooperation in completing the surveys. We also conducted site visits to 15 institutions of higher education, where typically we visited at least two departments with CAREER awardees. We would like to thank the faculty and administrators for their hospitality and cooperation.

We would also like to thank NSF's CAREER Coordinating Committee for their time and thoughtfulness in framing the evaluation questions, strengthening the evaluation design, and reviewing the final report. We especially want to thank Janet Rutledge who served as chairperson of the Coordinating Committee from the beginning of the study through the draft final report and Alison Flatau who has served as chairperson since then. We also appreciate the wise guidance of Conrad Katzenmeyer and Deh-I Hsiung, our program officers on this evaluation.

This report is based upon work supported by the National Science Foundation under NSF contract number REC-9452969 and REC-99-12174. Any opinions, findings, conclusions, or recommendations expressed in this report are those of the participants, and do not necessarily reflect the official views, opinions, or policy of the National Science Foundation.

EXECUTIVE SUMMARY

The National Science Foundation's Faculty Early Career Development (CAREER) Program, begun in FY 1995, funds beginning faculty members to develop academic careers that combine research and education. CAREER applicants must be in their first or second tenure-track or tenure-track-equivalent academic position and within four years of their first appointment. The CAREER awards are to provide stable support (typically \$50,000 a year for four or five years) so that faculty can establish their research programs and integrate their research and education activities. In the first three years (FY 1995 through FY 1997), NSF awarded CAREER awards to 1,037 faculty in institutions of higher education, or about 350 grants a year. All NSF directorates were represented. As the program entered its fifth year, NSF supported an external evaluation of the program. This is the final evaluation report.

The study was designed to describe the CAREER awardees and their professional experiences and activities after receiving the award and compare the professional activities of the awardees with the activities of comparable faculty who did not receive awards. The evaluation design was a quasi-experiment with the CAREER awardees group and two comparison groups. *NSF Comparison Group 1* were faculty members who applied for the CAREER award during the reference years and were not funded, and who subsequently received other NSF funding from regular research programs. *NSF Comparison Group 2* were faculty members who, between the reference years, met the eligibility requirements of the CAREER program, but chose not to apply for the award. However, they applied for and received other NSF funding from regular research programs. In the spring of 1999, mail surveys were sent to these groups, and to department chairpersons in whose departments CAREER awardees were housed. To elaborate on the survey findings and provide rich contextual data on the lives of CAREER awardees within their departments and institutions, site visits were also made to 15 higher education institutions.

Most CAREER awardees were funded by the NSF directorates for engineering (ENG), computer and information science and engineering (CISE), and mathematical and physical sciences (MPS). These directorates each funded at least 25 percent of the awardees. The directorate of biological sciences (BIO) funded 9 percent of awardees and was the next largest funder. Almost three-quarters of awardees were male, and 90 percent were white or Asian. Some 72 percent of them were housed in Research-I institutions. Across all awardees, the average CAREER award was \$256,000. Most funds were spent on research (82 percent) rather than education (18 percent). At least 80 percent of awardees spent funds on graduate student assistance, travel, supplies, summer salary, and equipment. To integrate research and education, most awardees either developed new research-based courses or involved undergraduate students in meaningful research. They have moved away from presenting research only to select graduate students.

Awardees were more likely to report that their award enabled them to integrate research and education than other NSF-funded faculty who never applied to CAREER. In fact, awardees were four times more likely to report integrating research and education. CAREER awardees also reported greater effectiveness in integration than comparable faculty. However, when asked what they would do once the award/grant was over, awardees and other NSF-funded faculty were equally likely to report that they would integrate research and education.

CAREER awardees reported they are advancing in their professional careers. On those outcomes over which they have control (e.g., course development, scholarly presentations, and related work by graduate students), they reported more progress than those NSF-funded faculty who never applied to the CAREER program. They also reported that the award has helped them advance at a faster pace than they would have without the award. Awardees also attributed a faster advancement to their CAREER award than NSF Comparison Group 2 attributed to their single largest grant. The effect sizes, while significant, are quite small. On outcomes involving departmental decisions (e.g., tenure and promotion), there were no differences between the two groups. Why did CAREER awardees report better professional outcomes? One possibility is that integration activities are responsible for the reported differences in professional outcomes. On two outcomes – scholarly presentations and perceived pace of career progression - there is supporting evidence that integration is responsible for the differences in professional outcomes.

Within the institution and in the larger scientific community, the CAREER award was held in very high regard and was seen as very prestigious. It is also used by departments to barter for increased standing within their institutions. Beyond its prestige, however, the award has had little impact on the institution, according to department chairpersons. It was not among the criteria for tenure or promotion, nor was it used as a strategy for improving course offerings.

Although required in the program application, the departmental endorsement did not lead to an active partnership with awardees. It was more often a sign-off than a commitment to mentoring CAREER awardees or enabling them to integrate research and education. In fact, most department chairpersons reported treating CAREER awardees and CAREER-eligible faculty the same. The departmental partnership that was to accompany the CAREER awards seldom included mentoring as CAREER faculty defined it.

CAREER awardees rated NSF's performance in managing the program as good or excellent, but they rated the quality of guidance *prior* to award higher than guidance *during* the award. About two-fifths of the awardees recommended more feedback from NSF, and an equal proportion recommended more NSF support for national or regional meetings among CAREER awardees. About two-thirds of the awardees recommended greater NSF financial support for their work, typically so they can support more than the one graduate student currently supported with the award.

1. HISTORY AND DESIGN OF STUDY

Overview

The Faculty Early Career Development (CAREER) Program is one example of the National Science Foundation's (NSF's) intensified efforts to strengthen the Nation's science, mathematics, engineering, and technology (SMET) academic workforce by integrating research and education in academic environments. Individual faculty members are an essential resource in achieving the integration of research and teaching, and NSF through the CAREER program is seeking to influence the priorities of individuals new to academic careers. CAREER is an unusual program in NSF's education and training portfolio because the individual faculty enhancement projects it supports have decentralized funding and management; that is, every NSF directorate is responsible for making and managing awards.

The NSF's disciplinary directorates fund the majority of individual CAREER projects, and the CAREER program is managed by a cross-directorate CAREER Coordinating Committee. As the CAREER program entered its fifth year, the CAREER Coordinating Committee asked the Directorate for Education and Human Resources (EHR) to fund an evaluation study. This is the final report on the evaluation of the CAREER program.

History of the Early Faculty Awards Programs

NSF support to enable young faculty to perform quality research and education began in 1983, when the Presidential Young Investigators (PYI) program was initiated. It remained active until the NSF New Young Investigators (NYI) program replaced it in 1992. Both programs were research-oriented and funded an average of 200 faculty per year. Another, more selective program began in 1992, when the White House asked NSF to institute the Presidential Faculty Fellows (PFF) program. The PFF differed from the PYI in that it awarded young faculty up to \$100,000 per year for five years with no matching-fund option. The PFF also put more emphasis on education and outreach activities.

In 1994, the Faculty Early Career Development (CAREER) program was approved by NSF's National Science Board; the first awards were made in FY 1995. Several programs were terminated and their objectives incorporated into CAREER. These were the NYI, Research Initiation Award, and Minority Research Initiation. These programs often were limited to select directorates and emphasized research, rather than other academic activities. The CAREER program consolidated these programs by creating a Foundation-wide program that supported the research and education efforts of beginning faculty within the context of their academic career development.

The most recent shift in early-career awards occurred in 1996, when the Presidential Early Career Awards for Scientists and Engineers (PECASE) program was instituted, replacing the PFF awards. Beginning in FY 1997, nominees for this award were selected by the NSF from among the “most meritorious first year CAREER awardees supported by the CAREER program.” In the same year, the CAREER program announcement termed CAREER “a premier program.” When a CAREER awardee is granted a PECASE award, the funding level is adjusted to the maximum amount of \$500,000 over a five-year period. A maximum of 20 PECASE awards are granted per year to NSF nominees (and 40 more to nominees of other federal agencies).

The CAREER Program

The CAREER program funds beginning faculty members to develop academic careers that combine research and education. More specifically, the statement of purpose initially focused on “the support for quality research and education in the broadest sense and the full participation of those traditionally underrepresented in science and engineering. This program enhances and emphasizes the importance the Foundation places on the development of full, balanced academic careers which include both research and education.”

CAREER applicants must be in their first or second tenure-track or tenure-track-equivalent academic position and within four years of their first appointment to such a position. Rather than nominations from institutions with a brief research abstract, as was the case with PYI, NYI, and PFF, CAREER applicants prepare and submit a 15-page Career Development Plan with a departmental endorsement.

Integrating research and education has been central to the CAREER program, and such activities are not seen as an add-on to other research and education activities. The 1997 CAREER Program Announcement provided multiple integration examples, including course or curriculum development; participation in pre-college educational activities; new approaches to graduate training and mentoring; and outreach to schools and communities.¹

What further distinguishes the CAREER award from its predecessors is the departmental endorsement. In the FY 1997 Program Announcement (p.4), the department head *must* provide a statement that “should include a description of how the faculty member’s career development plan is supported by and is integrated into the educational goals of the department and the institution.” [bold in original] Among the examples for support were mentoring, salary, instruments, lab facilities, and research support.

The funding and timeline for the CAREER award are intended to provide stable support at a sufficient level and duration to enable CAREER awardees to achieve the balanced education and research career development objectives of the program. CAREER awards initially were

¹ National Science Foundation (1997). Faculty Early Career Development (CAREER) Program, Guidelines for Submission of Proposals. NSF 97-87, p.4.

for at least three years but not more than five years. In FY 1996 and thereafter, the award duration was changed to at least four years but not more than five years. Over time, the funding maximum became \$500,000 and the minimum was changed to not less than \$200,000 for four years or \$250,000 for five years.

In the first three years (FY 1995 through FY 1997), NSF awarded CAREER awards to 1,037 faculty in institutions of higher education, or about 350 grants a year. All NSF directorates were represented. These 1,037 CAREER awardees are the focus of this evaluation.

Evaluation Design

The study was designed to address research questions calling for a description of the CAREER awardees and of their professional experiences and activities after receiving the award and for a comparison of the professional activities of the awardees with the activities of comparable faculty who did not receive awards. The evaluation design was a quasi-experiment with the CAREER awardees group and two comparison groups:

- *NSF Comparison Group 1* were faculty members who applied for the CAREER award during the reference years and were not funded, and who subsequently received other NSF funding from regular research programs. There were 440 faculty in this group.
- *NSF Comparison Group 2* were faculty members who, between the reference years, met the eligibility requirements of the CAREER program, but chose not to apply for the award. However, they applied for and received other NSF funding from regular research programs. These people were identified through a process of elimination. Surveys were mailed to a random sample of 924 academically-based NSF grantees who had received awards in the three-year period. We then asked respondents whether they were CAREER applicants and whether they had begun their first tenure-track or tenure-track equivalent position in the fall of 1991 or later.

The data for the study were collected through surveys and site visits. Mail surveys were sent to all of the faculty members in the CAREER awardees group and the two NSF Comparison Groups. In addition, mail surveys were sent to the department chairpersons in the 725 departments across 250 institutions in which the CAREER awardees were distributed. The response rates for each group are shown below.

Sample (n)		Survey Response Rate
CAREER awardees	(1,037)	77%
NSF Comparison Group 1	(440)	59%
NSF Comparison Group 2	(924)	56% ²
Department chairpersons	(725)	53%

The survey for CAREER awardees and the two NSF Comparison Groups included items on academic and employment backgrounds, career paths and productivity to date, activities undertaken in integrating research and education, and factors affecting academic progress. The comparison groups were essential in assessing the similarities and differences in the success and career advancement of faculty members supported by the CAREER program and those who were not supported by the CAREER program but through other NSF funding.

The survey of department chairpersons included items on their involvement with CAREER awardees, the extent and types of institutional support for CAREER and CAREER-eligible faculty, the image of CAREER, and the impact of the CAREER award on the department and institution.

In addition to the surveying conducted in the spring of 1999, site visits were made to 15 higher education institutions. The institutions varied in Carnegie Rating, geographic location, public vs. private support, and in the number of CAREER awardees on campus. Typically, at least two departments with CAREER awardees were visited in each institution. All site visits were conducted by two-person teams over two days. One-on-one interviews were conducted with the provost, deans, department chairpersons, senior faculty members, CAREER awardees, and other junior faculty members. The site visits served to elaborate on the survey findings and provided rich contextual data on the lives of CAREER awardees within their departments and institutions.

² Valid responses were obtained from 226 respondents. Another 350 were ineligible responses (38%) and 64 were invalid mailouts. The overall response rate was 44%. Of the remaining 284 non-respondents, if we assume a similar rate of ineligibility (38%), then the overall response rate would be 56%.

A note on ineligible responses: Each comparison group was limited to research grantees in the NSF data base. For NSF Comparison Group 2, respondents were declared ineligible based upon how they filled out the preliminary questions on the first page of the survey. That is, they were ineligible if they had applied for a CAREER award, were not currently holding a tenure track position, or began their first tenure track appointment before fall of 1991.

The survey data were analyzed to describe the CAREER awardees and their activities. The analyses comparing the CAREER awardees to the NSF Comparison Group 2 on their integration of research and education and their professional advancement used Ordinary Least Square (OLS) regression analyses. The groups were compared on each professional outcome, taking into account demographic characteristics of the sample (age, gender, minority status), the directorate of funding, and the Carnegie Rating of the institution of current employment.

Organization of the Report

Section 2 of this report focuses on the CAREER award itself—the purposes for which CAREER awardees use their funds and the adequacy of the grant. Section 3 describes integration of research and education. Section 4 assesses the effects of CAREER and compares the career development of CAREER awardees against other faculty. Section 5 looks at the CAREER awardees within their institutions, concentrating on the supports they received and the impact the award has had on the institution. Section 6 explores how the CAREER awardees assess NSF grant management and the recommendations they have for program improvement.

2. THE CAREER AWARD

Who are the CAREER Awardees?

Among the 1,037 CAREER awardees funded in the first three years (FY 1995 through FY 1997), the Engineering (ENG), Computer and Information Science and Engineering (CISE), and the Mathematical and Physical Science (MPS) directorates made the largest number of awards at 315, 291, and 254 awards, respectively.³ Some 73 percent of the CAREER awardees were male, and 90 percent were either white or Asian. Among institutions of higher education, 72 percent of the awardees were housed in Research-I institutions, followed by 13 percent in Research-II institutions. The background characteristics of the CAREER respondents (77 percent of the total) closely mirrored those of all awardees.

How similar are the CAREER awardees and those faculty in the two comparison groups? NSF Comparison Group 1 are faculty who applied for and were denied the CAREER award, and received other NSF funding. NSF Comparison Group 2 are other early career faculty who did not apply for the CAREER award and received other NSF funding. When the comparison groups were selected, the common thread was that all were recent doctorates, all were employed in tenure-track positions, and all were funded by the National Science Foundation. The CAREER awardees had funds to integrate research and education, while the NSF Comparison Groups had funds from the regular research program. But are their backgrounds similar, especially on characteristics that are typically associated with professional advancement? The variables we tested were: gender, age, race/ethnicity, and Carnegie Rating of institution of current employment.⁴ We also compared them by NSF directorate of funding.

As shown in Exhibit 2.1 and Exhibit 2.2, significant differences exist between the CAREER awardees and NSF Comparison Groups 1 and 2. Given that groups were not matched, it was not surprising that they varied on nearly all the demographic, institutional, and NSF funding-related variables. In addition to significant differences by NSF directorate of funding, the CAREER awardees also have had their awards somewhat longer (an average of 30.9 months for CAREER awardees versus 26.5 months for NSF Comparison Group 2). (Because some directorates awarded longer grants than did other directorates, we cannot determine the independent effect of length of grant.) It is important to note that there were no differences in either Carnegie Rating of doctorate-granting institution or award/grant amount between

³ The seven NSF directorates are biological sciences (BIO); computer and information science and engineering (CISE); education and human resources (EHR); engineering (ENG); geosciences (GEO); social, behavioral and economic sciences (SBE); and mathematical and physical sciences (MPS). Because so few CAREER awards were made in FY 1995-FY 1997 in GEO (47), SBE (19), and EHR (16), these awardees are grouped into a single category in the later analysis. The one awardee from the Office of Polar Programs (OPP) is also included in this “combined directorate” group.

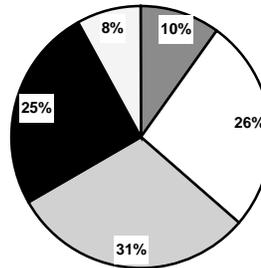
⁴ Race/ethnicity was used to see whether CAREER supported those groups that were underrepresented in mathematics, science and engineering. Traditionally underrepresented groups are all groups except whites and Asians.

CAREER awardees and either comparison group.⁵ To preview subsequent sections: because of the differences, it

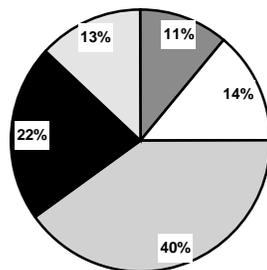
Exhibit 2.1

**CAREER and NSF Comparison Group Awardees by Directorate of Funding,
FY 1995 – FY 1997**

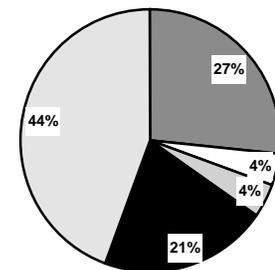
CAREER Awardees



NSF Comparison Group 1



NSF Comparison Group 2



Note: CAREER awardees and NSF Comparison Group 1 are quite similar, except a higher proportion of CAREER awardees are found in CISE and a lower proportion in ENG. CAREER awardees and NSF Comparison Group 2, on the other hand, are dissimilar, with much higher proportions of CAREER awardees in CISE and ENG and correspondingly lower proportions in BIO and the “combined directorates.” Among NSF Comparison Group 2, the 44 percent in “combined directorates” are EHR (23 percent), SBE (11 percent), GEO (8 percent), and O/D (2 percent).

⁵ Unlike CAREER awards, the range in grant amount for NSF Comparison Groups 1 and 2 was quite large.

Exhibit 2.2

Background Characteristics of CAREER and NSF Comparison Group Awardees

Characteristic	CAREER Awardees	NSF Comparison Group 1	NSF Comparison Group 2
Age in years	36.3	37.4	38.2
Percent Male	73	77	51
Percent in Traditionally Underrepresented Groups	8	15	19
Awards and Grants from All Sources	\$1,089,886	\$858,134	\$846,028
Percent Employed in Research I Institutions	70	51	45
Note: There were significant differences between CAREER awardees and the NSF Comparison Groups on each variable, except for the total of all awards, and the proportion of males among CAREER awardees and NSF Comparison Group 1. Almost half of NSF Comparison Group 2 were women. Women were at least half of the grantees in BIO, HER, and SBE, and over 43 percent of the grantees in MPS and CISE.			

will be important to include these background characteristics in analyses of the integration of research and education activities and of the professional advancement of CAREER awardees vis-a-vis comparable faculty.

Learning about and Applying to the CAREER Program

CAREER awardees found out about the program in several ways. When asked to check all that applied, more than half of the awardees (52 percent) learned of the program through NSF sources, such as publications, websites, program staff, or a NSF conference on funding. Exactly half reported they were told about the program by faculty in their own institution and about a quarter (27 percent) heard about it from faculty elsewhere.

In most directorates, awardees found out about the program from similar sources. Those in the CISE directorate, on the other hand, were more likely to find out about the program from a faculty member/colleague at another institution (39 percent vs. no more than 20 percent in all the other directorates) and less likely to learn about the program through NSF publications (30 percent vs. at least 40 percent all other directorates).

CAREER awardees and members of NSF Comparison Group 1 applied to the program for multiple reasons and both ranked the relative importance of these reasons. For both groups, funding was the most important reason for applying (4.6 on a five-point scale). The second most important reason for CAREER awardees was strengthening eligibility for tenure, followed by conducting research in a new area. For members of NSF Comparison Group 1, these two reasons were almost equally rated. Integrating research and education was less important, ranking fourth for both groups (3.4 on a five-point scale).

CAREER Award: Amount and Duration

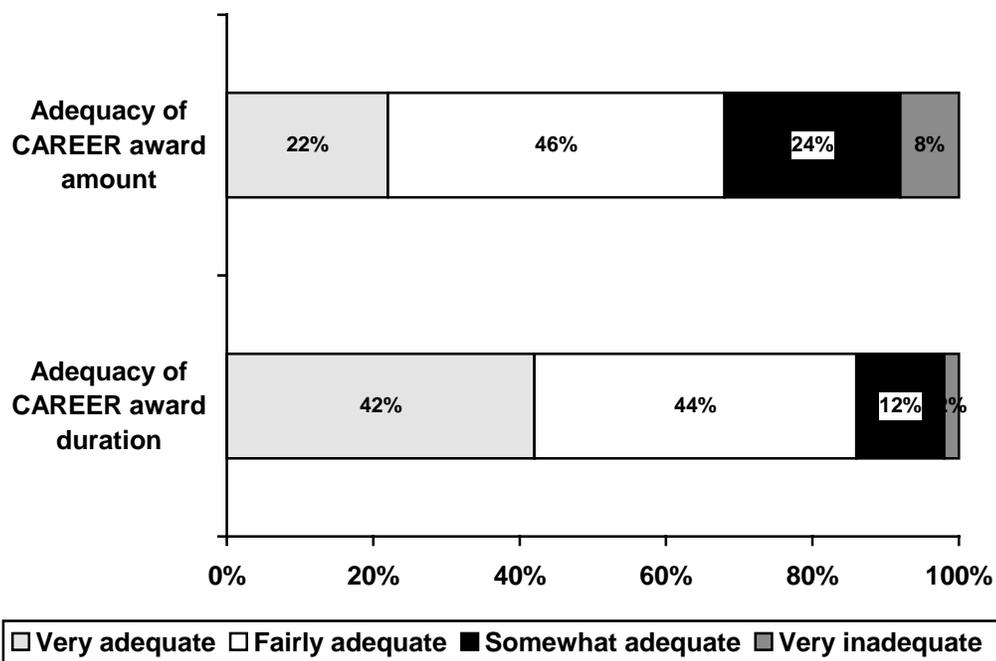
At the program level, both the average dollar amount and duration of the CAREER award remained the same between FY 1995 and FY 1997. The average CAREER award amounts ranged from \$248,000 in FY 1995 to \$265,000 in FY 1997. Similarly, during that period, the average award duration of four years did not change significantly.

In each year, over two-thirds of CAREER awardees noted that the funding amount was “fairly” or “very” adequate. CAREER awardees were more content with the duration of the award than with the amount of funding. Eighty-six percent of awardees felt that the duration was at least “fairly” adequate (Exhibit 2.3).

Of note is that the CISE directorate, on average, made much smaller awards than other directorates. CISE awards averaged \$3,265 a month compared to an overall mean across all directorates of \$4,204. BIO awards, on the other hand, were larger and averaged \$5,287 a month.⁶

Exhibit 2.3

Adequacy of CAREER Support



⁶ To compare awards with differing durations, a *per month* award amount (and adjusted for indirect costs) was computed.

Those awardees with three-year awards were more likely to report that the duration was inadequate than those with four-year awards or five-year awards.⁷ However, their assessment may be related to the amount of award since awardees with three-year awards had smaller total awards, and generally duration and amount of award were highly correlated.

Award duration was also mentioned during the site visits. Several CAREER awardees and senior faculty suggested that the CAREER program should consider stopping the “CAREER clock” just as some institutions stop the “tenure clock” for faculty on leave to start families. Extending the award for family leave was especially important for women faculty members.

We modeled these relationships using multiple regression techniques. The dependent variable was a four-point scale on adequacy of funding. Independent variables initially selected to predict variation in the level of satisfaction were gender, Carnegie Rating of institution of current employment (Research-I vs. non-Research-I), year CAREER award received, duration of award (three years, four years, or five years), NSF directorate of award (that is, CISE, ENG, MPS, and BIO, with the remaining directorates combined as they made few awards), underrepresented status (white and Asian vs. traditionally underrepresented groups), and amount of award (standardized to month and adjusted for indirect costs for FY 1995 and FY 1996 awardees). Of these, three pairs of independent variables were highly correlated [that is, (a) NSF directorate and amount of award, (b) duration and year of award, and (c) duration and amount of award], so directorate and duration rather than the other variables were used in the analysis.

Use of Award or Grant Funds

CAREER awardees spent more of their award funds on research than on education (82 percent vs. 18 percent). CAREER awardees were more similar to NSF Comparison Group 1 than they were to NSF Comparison Group 2 in their use of funds, with NSF Comparison Group 2 spending somewhat more funds (25 percent) on education.⁸

CAREER awardees reported spending their funds for multiple purposes (Exhibit 2.4). Overall, at least 80 percent of awardees spent funds on graduate student assistance, travel, supplies, and summer salary. Awardees from the CISE directorate were less likely to report spending funds on supplies and undergraduate assistance than other directorates, while virtually all BIO awardees reported spending money on supplies. About three-quarters of BIO awardees reported spending funds on graduate and undergraduate students, while more awardees in other directorates supported graduate students. Grantees from both NSF

⁷ Sixty-eight percent of respondents had four-year awards, 20 percent had five-year awards, and 12 percent had awards of three years.

⁸ CAREER awardees reported on their CAREER award, while the NSF Comparison Groups reported on their single largest NSF grant.

Comparison Groups were less likely than CAREER awardees to report spending funds on either graduate or undergraduate students.

Exhibit 2.4

Specific Use of Funds

Percent of recipients who use funds for:	Percentage*		
	CAREER Awardees (n=789)	NSF Comparison Group 1 (n=242)	NSF Comparison Group 2 (n=173)
Graduate student assistance	93%	69%	48%
Travel	90	69	68
Summer salary for yourself	86	70	66
Supplies	85	69	65
Equipment/instruments	82	66	68
Undergraduate student assistance	65	43	42

* For each case, there were significant differences between CAREER awardees and each comparison group.

Each column adds to more than 100 percent because respondents checked multiple categories.

3. THE INTEGRATION OF RESEARCH AND EDUCATION

Amount and Perceived Effectiveness of Integration

Integrating research and education has been central to the CAREER program, with the programmatic specifics evolving over time. In the FY 1997 program announcement multiple examples of possible education activities were listed, including course or curriculum development; participation in pre-college educational activities; new approaches to graduate training and mentoring; and outreach to schools and communities.

For CAREER awardees and NSF Comparison Group 2, we explored three aspects of integration, each of which is detailed in Exhibit 3.1 below.⁹ We did not include NSF Comparison Group 1 because of possible selection bias, as they were declined CAREER awards and these awards focus on integration.

Exhibit 3.1

Percentage Reporting Integration and Adjusted Means of CAREER Awardees and NSF Comparison Group 2 on Effectiveness and Future Integration of Research and Education

Integration	CAREER Awardees	NSF Comparison Group 2
Has your award/grant enabled you to further integrate research and instruction?	78%	52%
To date, how effectively have you been able to integrate research and education? <i>[not at all (1) to a great deal (5)]</i>	3.9	3.6
Once your award/grant is completed, how much will you integrate research and education? <i>[not at all (1) to a great deal (5)]</i>	3.7	3.7

Overall, CAREER awardees were more likely to report that their award enabled them to integrate research and education than those in NSF Comparison Group 2. In fact, CAREER awardees were four times more likely to report integrating research and education. CAREER awardees also reported greater effectiveness in integrating than did those in NSF Comparison

⁹ To model these relationships, a logistic regression was used to address whether the awards enabled recipients to further integrate research and education; while multiple regression was used with effectiveness and integration after completion of award. The dependent variable in the first question was a dichotomous question on integrating. The dependent variables about effectiveness and continued integration were both five-point scales. Independent variables included a block of demographic variables (age, gender, and membership in a group traditionally underrepresented in SMET), NSF directorate, and Carnegie Rating of institution (Research I vs. non-Research I). No independent variables were highly correlated with each other.

Group 2. Among CAREER awardees, those funded from the CISE, ENG, and MPS reported less effectiveness in integrating than did those awardees funded through the BIO directorate.

We also looked at whether CAREER awardees housed in Research I institutions were more likely to integrate research and education than those awardees housed in non-Research I institutions. CAREER awardees in Research I institutions were less likely to integrate research and education than those in non-Research I institutions, but for those who did integrate, awardees were equally successful in both types of institutions.

CAREER awardees, as did members of NSF Comparison Group 2, expressed similar intentions regarding plans to continue activities to integrate research and education at the end of their funding cycle. Both groups will continue integration activities between “some” and “a fair” degree (3.7 on a five-point scale). Among CAREER awardees, those from the BIO directorate plan to continue integration to a significantly greater extent (4.1) than those from the CISE, ENG, and MPS directorates (3.7). Similarly, awardees employed in non-Research I institutions expressed a greater likelihood to continue integration (3.9) than awardees in Research I institutions (3.7).

Collaborations and Partnerships Supported by the CAREER Award

Establishing collaborations and partnerships was strongly encouraged by each CAREER program announcement. CAREER awardees established an average of two collaborations, while the comparison groups averaged one such relationship. Only 18 percent of awardees reported that they had not established any collaborations, compared to 27 percent of NSF Comparison Group 1 and 70 percent of NSF Comparison Group 2. The proportion of CAREER awardees and comparison groups with collaborations is shown in Exhibit 3.2. For any given collaboration, more awardees reported involvement than the comparison groups except for those involving faculty in their own institutions. Significantly more awardees from the ENG directorate (73 percent) established industrial collaborations and partnerships while the BIO directorate (8 percent) and the combined directorates (5 percent) had the smallest proportions.

Student Involvement

CAREER awardees and both comparison groups worked primarily with graduate and undergraduate students, rather than younger students. Significantly larger proportions of awardees were involved with students from each academic level than both comparison groups (Exhibit 3.3).

Exhibit 3.2

Partnerships and Collaborations Established by CAREER Awardees and NSF Comparison Groups

Partner/Collaborator	Percentage		
	CAREER Awardees (n=772)	NSF Comparison Group 1 (n=235)	NSF Comparison Group 2 (n=173)
Faculty at their institution*	48%	48%	45%
Faculty at other institution in U.S.*	44	31	36
Private industry in U.S.*	39	15	7
Government research lab in U.S.*	21	12	8
International academic partnership*	21	12	16
High school*	11	4	6
Nonprofit research institution in U.S.	6	3	5
Middle school*	5	<1	1
Elementary school*	4	0	0
International non-academic partnership	3	1	4
National educational lab	1	1	-

* For these partners there were significant differences among the groups.

Exhibit 3.3

Student Involvement in CAREER-Related Activities

Percentage of respondents whose work involved students from:	Percentage		
	CAREER Awardees (n=791)	NSF Comparison Group 1 (n=228)	NSF Comparison Group 2 (n=154)
Graduate school*	95%	85%	70%
Undergraduate school*	83	73	73
High school*	16	7	8
Middle school	4	1	2
Professional school (e.g. medical, education, clinicians)	4	4	3
Elementary school*	3	<1	2

* For these categories, there were significant differences among groups.

Successful (and Unsuccessful) Examples of Integrating Research and Education

Successful Approaches

When CAREER awardees were asked to write what they thought were their most successful examples of integrating research and education, three-quarters of awardees responded. More than half of the awardees reported developing a lab experience for undergraduate and/or graduate students. About 43 percent created new undergraduate or graduate courses “from scratch” or made significant improvements in existing courses. Twenty-one percent developed both a course and a lab experience.

It gives the students a chance to experiment with the scientific methods and an opportunity to take responsibility for their own education. I've been impressed by how much students can behave like scientists when given the opportunity.

About 10 percent reported collaborating with elementary and secondary teachers and students, while 6 percent of awardees used their CAREER funds to help students publish their work and present at conferences. Those who worked at the elementary and secondary level found the experience particularly beneficial.

I have learned so much about teaching from the 4th, 8th, and high school teachers I am working with. They are exceptional teachers engaged in active learning, and I've learned more about teaching from them than in all the workshops I've attended.

Unsuccessful Approaches

About one in six CAREER awardees offered examples of what they saw as their most unsuccessful integration activities. These respondents typically were able to overcome or adapt to initial failure, since many also reported on successful integration activities as well. Some found that their research was too complicated or too narrowly focused for their undergraduate students. Others found that their classes were too large (~200 students) to effectively integrate research and education, particularly in a “hands-on” way. Some reported that they were unsuccessful because the topics they selected were still evolving and not firmly defined, and students became confused. Some students also reportedly became impatient with topics that would not be covered on the exam. Department and institutional resources also played a role, particularly when there was no systems support available to incorporate computer-based instruction into the classroom.

CAREER Awardees with Extensive Integration Activities

Site visits and surveys revealed that several CAREER awardees pursued a range of different and often innovative approaches to integrating research and integration. Exhibit 3.4 highlights six awardees who are carrying out an unusually extensive amount of integration activities.

Exhibit 3.4

Examples of Extensive Integration Activities Among CAREER Awardees

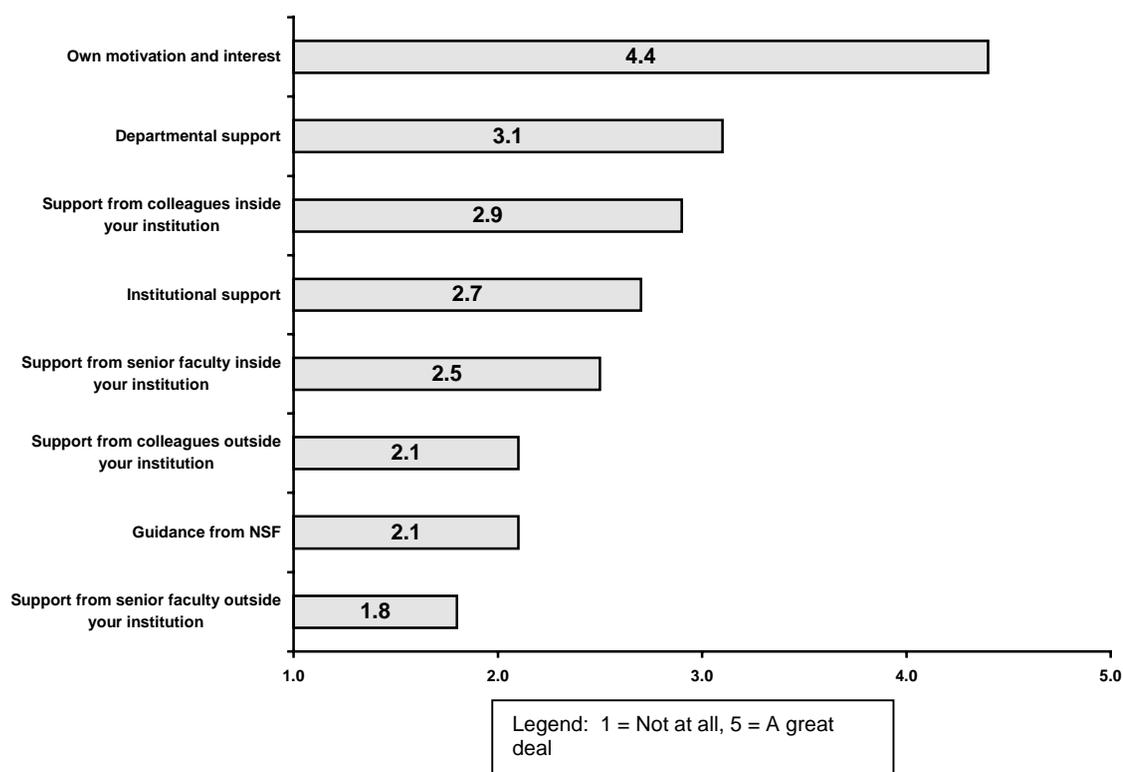
Description of CAREER Awardee	Integration Activities
<p>Awardee is in the Mechanical Engineering department at a Research I institution. When she received the award in 1997, she was in her first year in a tenure track position.</p>	<ul style="list-style-type: none"> • Involved undergraduate students in lab projects, who were called research assistants, not hourly employees. • Instituted an honors in research distinction for undergraduates. • Hosted workshops for undergraduates in order to teach them about graduate school and research.
<p>Awardee is in the Mechanical Engineering department at a Research I institution. When he received the award in 1996, he was in his first year in a tenure track position.</p>	<ul style="list-style-type: none"> • Created three new courses with a lab component. • Mentored graduate and undergraduate students in research work, who in turn have collaborated with other institutions. • Supervised a team of undergraduates who built an underwater robot and participated in an inter-collegiate competition. • Helped organize a summer course at a public high school and paid two undergraduates to teach it.
<p>Awardee is in the Chemistry and Physics department at a Master's I institution. When he received the award in 1996, he was in his second year in a tenure track position.</p>	<ul style="list-style-type: none"> • Involved undergraduates in a state of the art research program to interact with researchers from Research I Institutions. • Established a state-of-the-art computational chemistry laboratory for both research and educational use. • Developed innovative uses of molecular modeling in classrooms. • Developed a Saturday science academy for "at-risk" students and recruited top high school students.
<p>Awardee is in the Chemistry department at a Baccalaureate I institution. When he received the award in 1995, he was in the third year in a tenure track position.</p>	<ul style="list-style-type: none"> • Restructured the departmental requirements for a senior research thesis for all majors. As a result, all students now have access to research opportunities. • Taught in more than 30 third to sixth grade classrooms and provided teachers with curricular materials.
<p>Awardee is a faculty member in a Marine Science department. She received the award in 1997 and was entering the second year of a tenure track position.</p>	<ul style="list-style-type: none"> • Developed an interactive program with a K-12 center. Students e-mail researchers in the field and meet with them periodically. • Established a good working relationship with two Historically Black Colleges and Universities (HBCUs) to introduce minority students to marine science experiences. • Developed public outreach displays for research.
<p>Awardee is in the Industrial Engineering department at a Research II institution. She received the award in 1995 and was in the second year in a tenure track position.</p>	<ul style="list-style-type: none"> • Educated the wider community using pamphlets, lectures, virtual reality and videos. • Provided an industry experience for students. • Developed an undergraduate curriculum and a graduate specialty in her field. • Created a summer educational experience, taking both graduate and undergraduate students to conferences, labs, and large industrial companies throughout the southeastern U.S.

Factors Enhancing the Integration of Research and Education

As Exhibit 3.5 illustrates, CAREER awardees felt that their own motivation was the most important factor that enhanced their ability to integrate research and education to the greatest extent (4.4 on a 5-point scale). The CAREER awardees and both comparison groups were most influenced by factors closely related to them—first by their own motivation and interest, then by factors in their department and institution, and finally factors outside their institution. Generally, awardees at Research I institutions were less likely than those in non-Research I institutions to identify facilitating factors. The rank order of factors is almost the same in both types of institutions.

Exhibit 3.5

Factors Enhancing Ability to Integrate Research and Education, as Reported by CAREER Awardees



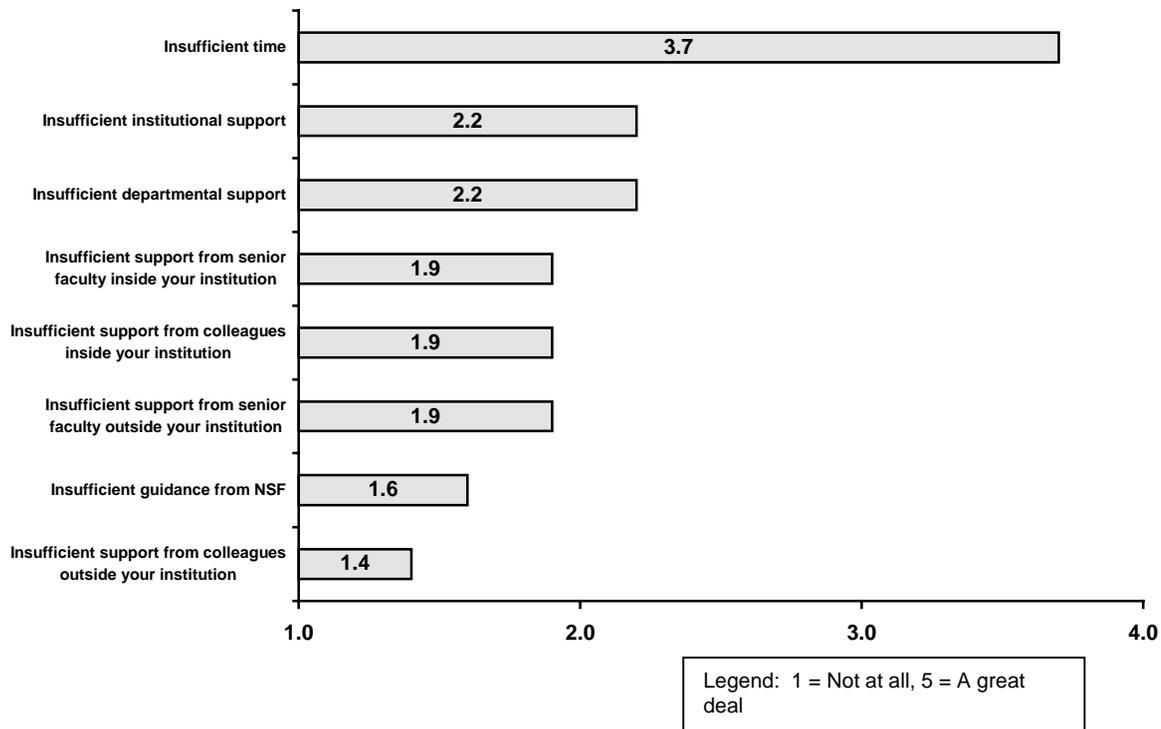
Factors Hindering the Integration of Research and Education

Insufficient time was considered the greatest hindrance to CAREER awardees' and both comparison groups' ability to integrate research and education (Exhibit 3.6). Generally, awardees saw hindrances as significantly less problematic than did one or both comparison groups. As found for facilitating factors, CAREER awardees in Research I institutions were

less likely (than those in non-Research I institutions) to identify barriers as important, and again factors were similarly ranked in both types of institutions.

Exhibit 3.6

Factors Hindering Ability to Integrate Research and Education, as Reported by CAREER Awardees



In summary, CAREER awardees are integrating research and education and more so than comparable faculty. For the most part, they are developing new courses and lab experiences, usually for undergraduate students, but some are working with elementary and secondary school teachers and students. Awardees offered multiple examples of their success and some shared their failures, especially where they were overly ambitious or there was not a good match between their research and teaching.

4. Effects of the CAREER Program on Professional Advancement

To assess professional advancement, CAREER awardees and NSF Comparison Group 2 were compared on several areas of their professional careers: courses or curriculum materials developed, the total number of publications and presentations they had completed related to their current award/grant, their tenure status, and their perceptions of how their award/grant had affected the speed of their career progression.¹⁰ Additionally, the two groups were compared on their receipt of promotions and regular salary increases, as well as on whether they had students who were completing or had completed masters or dissertation work based on the current award/grant. Exhibit 4.1 displays the raw means for the two groups on each variable.

Exhibit 4.1

Reported Professional Advancement for CAREER Awardees and NSF Comparison Group 2

Activity	CAREER Awardees	NSF Comparison Group 2
Have developed courses or curriculum modules	70%	34%
Have students working on master's or doctoral thesis based on work supported by award/grant	88%	49%
Number of publications	23.9	14.0
Number of presentations	13.3	8.2
Received salary increase	95%	88%
Received promotion	40%	38%
Granted tenure	34%	31%
Perceived pace of advancement (where "3" is "no difference" and 4 is "faster pace")	4.0	3.8

Sample size (n) for CAREER awardees ranged from 744 to 796, and for NSF Comparison Group 2 from 147 to 186.

On those outcomes over which they have control (e.g., course development, scholarly presentations, related work by graduate students), CAREER awardees have made more progress than those NSF-funded faculty who chose not to apply to the CAREER program. They also perceived that the award has helped them advance at a faster pace, and at a faster pace than reported by other NSF- funded junior faculty. On outcomes involving departmental

¹⁰ The data for these analyses come primarily from the surveys of CAREER awardees and members of NSF Comparison Group 2. We did not include NSF Comparison Group 1 because of possible selection bias, as they were declined CAREER awards. Number of awards received was a potential outcome variable, but the non-response rate for the item was so high that it was not included in the analysis.

decisions (e.g., tenure and promotion) that are out of the grantee's direct control, there were no differences between the two groups.¹¹

The perception among CAREER awardees that the award was speeding up their advancement was supported by the chairpersons of departments housing awardees. Seventy-one percent of the department chairpersons reported that CAREER awardees' careers were progressing "faster" or "much faster" than other CAREER-eligible faculty in their department. This finding may help assuage concerns that the award puts an undue burden on awardees to integrate research and education at the same time that they are seeking tenure. Rather than CAREER burden, what may be operating are the pressures that all tenure-track faculty reported they face. At least three-quarters of all respondents report that they have sacrificed time with friends and family as well as time for personal activities and interests in the pursuit of their professional goals.

Equally interesting are those outcome measures where there are no significant differences, especially promotion and tenure.¹² The CAREER award may indeed have had little institutional impact. It is also the case that about 60 percent of the respondents have not yet come up for promotion or tenure. For those CAREER awardees with tenure, 56 percent perceived the award to be a major factor in the receipt of tenure. The perceived importance of the award on tenure varied by Carnegie Rating of institution. More awardees from non-Research I institutions believed the award to be a major factor than those from Research I institutions (64 percent vs. 52 percent), perhaps because of the relative rarity of the award in non-Research I institutions.

Thus far, two themes have emerged in the analysis. One is that CAREER awardees are more likely to report engaging in integration activities than NSF Comparison Group 2, as was reported in section 3. The other is that CAREER awardees are more likely to outperform NSF Comparison Group 2 on selected professional advancement indicators, including the number of presentations, the perceived speed at which one's career is progressing, course development, and the extent to which one works with students. The question remains, what could be the reason that CAREER awardees have better professional advancement outcomes than comparable faculty?

¹¹ We used two regression approaches to evaluate whether CAREER awardees differed from NSF Comparison Group 2 on the outcomes described above. For continuous outcome variables (e.g., number of publications), we used OLS regression analyses to test for differences in the average outcomes of CAREER awardees and NSF Comparison Group 2. For categorical outcome variables (e.g., tenure status), we utilized a logistic regression approach to test the hypothesis that CAREER awardees would be more likely to report a favorable outcome than the comparison group. We ran separate models for each outcome. In each model, we controlled for the same five covariates (age, gender, minority status, Carnegie rating, and NSF directorate). Correlation matrices, tolerance statistics, and results of contingency table analyses showed that these covariates were not highly correlated with each other, so it was appropriate to enter them simultaneously into the subsequent analyses.

¹² Salary increases have been earned by virtually all respondents.

One possible hypothesis is that the CAREER award itself was associated with better professional advancement outcomes. Our results do show a direct relationship between the award and selected professional advancement outcomes. Another hypothesis is that engaging in integrating research and education would be directly associated with better professional advancement outcomes. To test this hypothesis, we examined the direct relationship between integration activities and the professional advancement outcomes. Results showed that each of the three integration activities (i.e., greater integration of research and education, perceived greater effectiveness at integrating activities, and expected integration activities post-award) was positively associated with each of the professional advancement outcomes. This suggests that greater efforts geared toward integration were related to greater professional advancement.

The question still remains: does the CAREER award first lead to integration, and then is integration responsible for the observed differences in professional advancement outcomes? That is, do integration activities “mediate” or account for the relationship between CAREER award status and professional advancement outcomes? To test this hypothesis, we simultaneously modeled the effects of integration and CAREER award status (that is, group status—CAREER award vs. NSF Comparison Group 2) in the prediction of professional advancement outcomes. Results suggested that the significant link between group status and two of the professional advancement outcomes could, in fact, be fully explained by integrating activities. Specifically, the effects of group status on the total number of presentations and on the perceived progression of one’s career were accounted for by greater integration. The effects of award/grant on these outcomes are mediated by integration. In addition, in predicting the amount of course development, integration activities as well as CAREER award status remained significant. That is, integration activities only *partially* mediated the relationship between CAREER award status and the development of course curricula. Thus, CAREER award status and integration activities each exert an independent and direct contribution to the development of course curricula.

For the fourth outcome, student involvement, the effects of CAREER award status were direct and did not necessarily “go through” integration efforts. This suggests that it may be an aspect of receiving the award, in and of itself, that is linked to greater student involvement. That relationship may be at least partially explained by the fact that CAREER awardees are more likely than NSF Comparison Group 2 to support graduate students with award funds.

A word of caution in interpreting these findings. It is important to bear in mind that the differences in professional activities and progress may be a function of unmeasured baseline differences (e.g., in motivation, confidence, competence) between the CAREER awardees and the NSF Comparison Group 2. There is no way to dismiss this possibility because we do not have the data which would allow us to disentangle this potential confound.

In summary, CAREER awardees report they are advancing in their professional careers. On those outcomes over which they have control (e.g., course development, scholarly presentations, related work by graduate students), they have made more progress than those NSF-funded faculty who never applied to CAREER. They also perceive that the award has helped them advance at a faster pace, and at a faster pace than reported by other NSF-funded junior faculty. On two outcomes—scholarly presentations and perceived pace of career progression—the effects of the award/grant are mediated by the integration of research and education. On a third outcome—course development—the effects of the award/grant are partially mediated by the integration. On those outcomes that are institutionally based (e.g., tenure and promotion) and out of their direct control, there were no differences between the two groups.

5. The CAREER Award within the Institutional Context

The Department as a Partner in the CAREER Awardee's Career Development

From the beginning of the CAREER program, departmental endorsement was a part of the applicant's proposal. In FY 1995 and FY 1996, the program announcement noted that the department chairperson's signature on the proposal attests to "departmental endorsement of the Career Development Plan and the department's partnership in the applicant's career development." Among the examples for support given were mentoring, as well as salary, instruments, laboratory facilities, and research support. For all three years, the program announcement also contained a section that the annual progress report "must be countersigned by the awardee's department head or equivalent of the work plan and partnership in the individual's career development."

The most commonly mentioned supports to CAREER and CAREER-eligible faculty were computer equipment, telephone and fax charges, and laboratory facilities. These supports are often included in start-up packages, and over 85 percent of the department chairpersons reported that these were provided (and provided equally) to new, beginning faculty. Eighty-five percent of department chairpersons also indicated that awardees received mentoring or guidance from senior faculty, but only 35 percent of awardees (and a quarter of comparison group faculty) reported receiving such support. As our site visits revealed, the difference may lie in what is considered mentoring, slippage between a mentoring program as delivered and a mentoring program as received, and in the limitations of what senior faculty can contribute. A typical response from our site visits is captured in this quote from a CAREER awardee.

There is no continuous source of mentoring in the department. We have a mentoring meeting annually (senior faculty and chair), but it's more of a chat for an hour than anything else.

Department chairpersons, for the most part, saw themselves as active supporters of CAREER awardees in the same way that they support other new, junior faculty. Contrary to the intent of the departmental endorsement, they did not view their involvement with CAREER awardees as different from their involvement with other faculty. In fact, 89 percent of them noted that their own level of involvement with each group is the same, while another 9 percent said they are more involved in awardees' activities and two percent said they were less involved with awardees.

The Match Between CAREER and the Institution

How does the purpose of the CAREER award mesh with the mission of the institution? The award, with its focus on integrating research and education, cuts right to the heart of the question of the essence of a university—the fundamental tension between emphasizing

research and education. During the site visits we asked respondents: "Would you say this institution is more oriented to research, education or both?" Many respondents, particularly senior faculty and university administrators, said: "it is both." or "you cannot separate them" or "it's a continuum." However, junior faculty at these same universities often said clearly that the institutional priority is research.

Lip service is paid to the importance of education, but the evidence is that research is what matters. All junior faculty say so, the senior faculty gloss over it (of course, it should be integrated), but don't point to any rewards for the integration or for good teaching.

From the site visit reports, it became clear that the context of the university, rather than the mission of the CAREER award, was the primary determinant of priorities for young faculty members. Where the mission of the department or the university did not match that of the award, there was little question that research predominated. Similarly, where the institution was clearly oriented to education, it seemed that the award may have enhanced, but certainly did not drive, that orientation.

The Value of CAREER Awards within Departments and Institutions

The CAREER award appeared to have both a real and a perceived value within departments and institutions. Its real value was monetary and the advantages money could buy, such as financial support for graduate students and viable research projects for graduate student theses.

CAREER allows young faculty in a short time to establish an independent research program. If they couldn't do that, the older group would grab them and involve them in their research. You get to do your own research—that's the bottom line.

Its perceived value was the award's prestige. Across institutions, faculty and administrators frequently used the same phrase to describe it: CAREER was a "feather in the cap" for awardees, departments, and institutions.

The dean especially spoke of the NSF prestige factor and said: "We put it (the CAREER awards received) in the sound bytes because alumni know what NSF is."

Exhibit 5.1 presents an assessment of the CAREER award's value from two viewpoints—the department chairpersons' and the awardees'. In rank ordering, there was marked agreement between the two. Both the chairpersons and the awardees saw the award as prestigious in the institution, prestigious within the scientific community, and as an important stepping stone to

advancement for the awardees. Rated slightly lower is the view that the award is important for getting tenure (3.9 for both chairpersons and awardees). Chairpersons assessed the CAREER award more highly than did the awardees, except for promotion and tenure where the award was equally valued by both.

Exhibit 5.1

Chairpersons' and Awardees' Assessment of the CAREER Award's Overall Value

	Mean*	
	By Chairpersons (n=363)	By CAREER Awardees (n=784)
Prestigious in this institution	4.4	4.1
Prestigious within the scientific community	4.3	4.1
Important stepping-stone to advancement within the department	4.1	4.0
Important for getting tenure	3.9	3.9
Important for getting a promotion	3.8	3.8
A way of leveraging external funding sources	3.7	2.9
Important for getting maximum salary increase	3.5	2.9

* Possible range: 1 = Not at all to 5 = A great deal

Among CAREER awardees themselves, the importance of the award in the tenure process was mentioned repeatedly during the visits.

Because CAREER is an “award” not [only] a grant, it can be included in the award section of the tenure dossier unlike traditional grants. Awardees can be recognized for the award’s financial and merit value.

The Impact of CAREER Awards on Departments and Institutions

Department chairpersons believed the CAREER award had the strongest effect on how the institution and the department are viewed by the external scientific community (3.7 and 3.6, respectively, on a five-point scale).

The CAREER award improves the image of the departments on campus—and this is one of the more distinguished departments on campus in part because of the award. When I ask for resource allocations, my requests are heard.

Other effects of the award, such as whether it changed the criteria used for promotion and tenure or influenced curriculum content, are clustered around 3.0 ("some effect") on a five-point scale. The lack of influence on curriculum or teaching may reflect the modest interest in integrating research and education. The prevalence of the 3.0 rating (the mid-point of the scale) may well be the "gentleman's C," as the site visits reveal little evidence of any effect from the award. The responses of administrators—deans and provosts speaking about their institutions—were lukewarm at best, especially in Research I institutions.

Finally, there was some evidence from the cases that the award had greater effect when it matched the goals/objectives of lesser-known departments to improve their standing around research, i.e., schools known for education that wished to become better known for research in the external scientific world.

The university is trying to redefine itself, so the CAREER award is a big deal here. They are beginning to put more emphasis on research in tenure decisions (and) the award is a great vehicle for building up the research programs for new, young faculty.

In summary, CAREER awardees were supported by their departments, although not in the partnership envisioned in the program announcement. The CAREER award was seen as having great prestige within the institution and the larger scientific community. The prestige of the award appeared to be somewhat independent of the award's purpose to integrate research and education. While chairpersons overwhelmingly agreed that research and education should be integrated, CAREER awardees and CAREER-eligible faculty noted that research took precedence, particularly in Research I institutions.

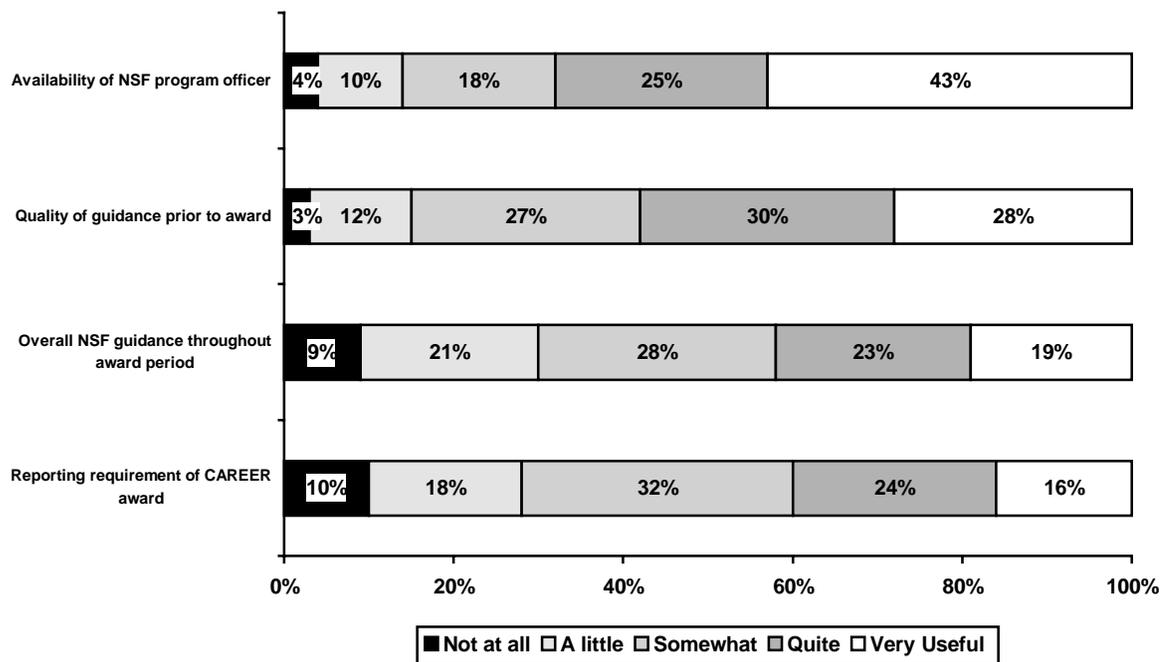
6. CAREER Awardees' Views of the NSF CAREER Program

NSF Management of the CAREER Award

Awardees rated NSF management of the CAREER program overall “good” or “excellent” (45 percent and 44 percent, respectively), and this rating did not differ by directorate. Awardees rated the availability of the NSF program officer and guidance *prior* to grant award significantly higher than guidance received *during* the grant period (Exhibit 6.1). The ratings are quite consistent across the directorates.

Exhibit 6.1

CAREER Awardees' Rating of the Usefulness of NSF's CAREER Program (n=783)



Recommendations for Program Improvement from CAREER Awardees

Program changes recommended by awardees (and other faculty and administrators) were generally on the margin of the program. No one recommended a major overhaul of CAREER. Recommendations fall into several categories, including funding, feedback from NSF on both substantive and procedural issues, and opportunities for networking and collaboration.

More financial support

More than half of the CAREER awardees recommended more financial support both from NSF and their home institutions (Exhibit 6.2). Many awardees and department chairpersons requested larger grants in order to be able to integrate their research and education. Specific suggestions were either to increase the funding by a factor of 1.5 or 2 or to expand the award size to \$75,000 to \$100,000 a year excluding indirect costs. Several awardees noted that current funding allowed them to support annually one graduate student plus either some summer salary or travel. They recommended being able to support two graduate students per year. Several CAREER awardees and department chairpersons suggested either removing the industrial match or removing the obstacles to matching, such as accepting used equipment and in-kind donations as a match.

Exhibit 6.2

CAREER Awardees Recommended Changes in CAREER Program

	Percentage (n=791)		
	More	Same	Less
Financial support from NSF	68%	32%	0%
Financial support from home institution during award period	55	44	1
Feedback from NSF	43	55	3
NSF-sponsored meeting of CAREER awardees	40	49	11
Administrative/accounting requirements for home institution	9	74	17
Reporting requirements for the CAREER award	4	83	14

Closely aligned with increased funds for CAREER awardees was a suggestion to reduce the institution's indirect cost rate. Many either suggested an increase in the total award amount or a reduction in indirects; either suggestion was designed to increase the funds available to the awardee. Indirect costs may have been a target because allowable costs grew during the first three years of the program. Those receiving the grant in its first year (FY 1995) had a 10 percent indirect cost rate, those grants awarded in FY 1996 had a 20 percent indirect cost rate, while all those funded subsequently had the full negotiated overhead rate of the university (usually ranging between 40 percent and 60 percent).

Feedback from NSF

Two-fifths of the awardees also wanted more feedback from NSF, particularly on integrating research and education activities. The following comment was typical of those made by awardees.

NSF should make the connection between research and education more explicit and maybe develop criteria that document specific activities that integrate research and education to help CAREER awardees better understand what they mean by integration.

Awardees were interested in the relative importance of research and education, on what was expected in education, and in obtaining information on successful examples of integrating research and education. Others suggested that NSF publicize the program more broadly within institutions and departments to support awardees in their integration efforts. Lastly, awardees often wanted to know how they were doing, whether they had met expectations on integrating research and education, and whether they could make changes from their original plan.

Networking among awardees

Two-fifths also recommended more NSF support for national or regional meetings for awardees to meet to share information, to instill a sense of camaraderie, and to reinforce the special nature of the award. Among the topics suggested were:

- orientation seminars (e.g., funding, grants management, and reporting);
- ideas and information about integrating research and education;
- current and planned research;
- science education and education methods seminars; and
- obtaining balance (e.g., “given only 24 hours in a day, what does one leave out?”)

Awardees also had multiple suggestions for how to network. Many mentioned either regional or annual meetings, such as the one held in January 1999. Others suggested electronic networking through web pages.

In summary, CAREER awardees were satisfied, for the most part, with the NSF management of the CAREER program. They did not recommend major changes. As intended, the program has funded promising faculty who reported that they integrated their research and education, and who integrated more and more effectively than comparable faculty. The CAREER faculty also outperformed their counterparts on several to professional outcome measures, although to date their rates of tenure and promotion were the same. While the CAREER award was considered very prestigious within institutions and departments, it has not fostered the mentoring partnerships envisioned in the program announcement, and, within the first five years, it has had little impact on the institution itself.

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

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