Teaching Effectiveness and Government Awards

Study shows that publication and government awards are good indicators of ability in teaching undergraduates.

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In recent years, articles in American newspapers, magazines, and Sunday supplements have depicted faculty members in colleges and universities who publish reports, and also those who are concerned with obtaining government support for their research, as poor instructors. Such articles can sometimes be recognized by their interesting and inflammatory titles, such as "The flight from teaching" or "Publish or perish," used for dramatic emphasis (*1–3*). Abelson recognized the trend when he wrote in a recent editorial in *Science* (*4*), "a few years ago . . . a number of articles in major publications asserted that research efforts by professors were destructive to the teaching functions of universities." This charge has often been countered by government officials, academic administrators, and academicians, who maintain that such a cause-and-effect relationship simply does not exist. Unfortunately, most of the charges (*5–8*) and the replies (*2, 3, 9–11*) have been highly impressionistic and often based upon anecdotal information.

With this problem in mind, I began an investigation of the relationships between publication, success in obtaining government awards, and teaching effectiveness. In the literature I found no report of any previous study in which these three variables had been considered together. Moreover, the sample on which my investigation was based was one of the largest that has been used in studies dealing with the problem of teaching effectiveness at the college level.

Three bodies of data provided me with an opportunity to study the general question: Is the faculty member who publishes and who holds or has held a government award an effective teacher? The first of these bodies of data resulted from a survey made at Tufts University in the academic year 1965–66. In the fall semester, a student group, under the guidance of John Newell of the department of education, made a survey of student opinion of faculty performance. The students were asked to evaluate the performance of approximately 130 faculty members from the College of Liberal Arts (which includes sciences, social sciences, arts, and humanities) and the College of Engineering, on the Medford campus, in the conduct of approximately 155 courses. The group making the survey was primarily interested in evaluating teacher performance in courses usually attended by students in the first 2 years of their undergraduate program in those two colleges. All the students in certain selected undergraduate courses were asked to evaluate the professors teaching the classes in which they were currently enrolled. Students handled the distribution, monitoring, and collection of the evaluation forms. Many faculty members believed that the courses chosen for evaluation of teacher performance were representative of those routinely offered at Tufts. The survey produced a number of confidential summaries, which have never been published (and are not likely to be).

I selected for further study those evaluated courses that were conducted by full-time faculty members with the ranks of instructor through professor. Eliminated from further consideration were elementary courses conducted by lecturers, part-time instructors, and graduate teaching assistants, since these individuals are generally not eligible to apply for government awards through the university. Data on their courses would have had no bearing on this particular study.

The value of student opinion about teaching effectiveness is a subject that has raised much controversy. A majority of the earlier reports (*8, 11*) suggest that the student, as a consumer, is in the best position to evaluate teacher effectiveness. Some observers consider student evaluation of teaching effectiveness to be fallible (*7*); a few have regarded it as unacceptable (*12*). I consider student evaluation to be an adequate indicator of the faculty member's teaching effectiveness.

A second source of information available in the Office of the Assistant Provost was the file of records of current and past government awards made to members of the Tufts faculty. This file had been maintained in excellent condition by my predecessors, Leonard C. Mead and Warren Teichner. The records for the past 8 years were particularly useful.

The third body of data came from the Tufts yearly publication *Faculty Annual*, which lists the yearly activities of each faculty member under the categories "Publications" and "Professional activities." The June 1966 issue furnished the number of published articles produced by each evaluated faculty member in the areas of science and engineering for the period covered by the students' evaluation study.

The three groups of individuals who collected the three bodies of data had no common or coordinated plan, and their studies may be regarded as separate and distinct.

Data Tabulation

A combined tabulation (Table 1) of the three bodies of data reveals some interesting trends. As used in Tables 1 and 2, the term *senior* refers to associate professors and professors, while *junior* refers to instructors and assistant professors.

Included under Science and Engineering (Table 1) are the departments of biology, chemical engineering, chemistry, civil engineering, geology, mathematics, mechanical engineering, physics, and psychology. Social Science (Table 1) encompasses the departments of child study, economics, education, government, history, and sociology. Arts and Humanities (Table 2) includes classics, drama and speech, English, fine arts, German, music, philosophy,

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religion, and the romance languages.

In Table 1 the support status of the faculty member is designated either "external support," "faculty award," or "no support." "External support" means that the individual received support for his professional activities from a government agency. As is the case for so many other American universities, the largest share of external support for the faculty of Tufts University came from the U.S. Public Health Service and its component agencies, the Department of Defense and its component agencies, the National Science Foundation, the Office of Education, and the Atomic Energy Commission.

Tufts University, like many other American educational institutions, maintains an internal faculty research fund to provide small amounts of money for various projects grouped under the heading "Faculty Development." Most of the awards (which are usually under $1000) are administered by a committee consisting of one representative each from the Sciences, Engineering, Social Sciences, and Arts and Humanities divisions of the university. The ex officio members are the dean of the Graduate School and the assistant provost (in previous years the research coordinator). Individuals who received support only from the faculty-award program make up the group designated "faculty award" in Table 1; individuals who received both faculty-award and external support are included in the group designated "external support."

The students were asked to evaluate the faculty member as ranking in the first, second, third, or fourth quartile of teaching excellence in comparison with other Tufts faculty members and not according to some external or theoretical evaluation system. These four groups were coded very simply with numerical designations of 1, 2, 3, and 4; the highest teaching ability being represented by 1 and the lowest by 4. The evaluation average for the individual faculty member was derived from the total number of returns, the students' evaluations, and the number of courses taught by the individual in question. A similar index rating had been used in an earlier investigation (*11*).

Also, for the senior Science and Engineering faculty it was possible to obtain an adequate sample of publications for an analysis of number of publications relative to evaluation and support status.

Despite some irregularities in the data (Table 1), in general those faculty members who were receiving or had received support from government agencies were ranked highest in teaching abilities. Those faculty members who had never received support were classified in the lower ranks. Faculty members who had received only Tufts University faculty awards were given intermediate ratings.

The mean number of publications for senior Science and Engineering faculty was, as might be expected, highest for the external-support and lowest for the no-support categories. Thus, Table 1 shows that those Science and Engineering faculty members who were receiving, or had received, external support were rated highest by the students and produced the largest number of publications.

The data for the Arts and Humanities faculty (Table 2) are presented in two groupings rather than three. The data for the one senior faculty member who had received a government award are combined with those for individuals

Table 1. Student evaluations of the Science, Engineering, and Social Sciences faculties in relation to research support (see text).

Item	External support	Faculty award	No support	Total
	Science and Engineering, senior faculty			
Total returns	640	211	346	1197
Number of faculty	13	5	13	31
Number of courses	15	6	18	39
Evaluation (average)	1.90	2.15	2.40	2.09
Standard deviation	.88	.88	.97	.94
Number of publications (average)	1.90	.50	.08	
	Science and Engineering, junior faculty			
Total returns	109	50	164	323
Number of faculty	3	4	7	14
Number of courses	3	5	8	16
Evaluation (average)	1.88	2.66	2.49	2.31
Standard deviation	.91	.92	.85	.88
	Social Science, senior faculty			
Total returns	*	62	409	471
Number of faculty		4	11	15
Number of courses		4	14	18
Evaluation (average)		2.65	2.38	2.42
Standard deviation		.93	.93	.93
	Social Science, junior faculty			
Total returns	79	154	665	898
Number of faculty	3	2	11	16
Number of courses	5	4	16	25
Evaluation (average)	2.14	1.92	2.57	2.42
Standard deviation	.90	.93	.90	.92
	Totals			
Returns	828	477	1584	2889
Number of faculty	19	15	42	76
Number of courses	23	19	56	98
Evaluation (average)	1.92	2.19	2.48	2.27
Standard deviation	.89	.94	.93	.94

* The record of one faculty member has been eliminated because of ease of identification locally.

Table 2. Student evaluations of Arts and Humanities faculty in relation to research support (see text).

Item	External support and faculty award	No support	Total
	Senior faculty		
Total returns	199	217	416
Number of faculty	5	7	12
Number of courses	6	9	15
Evaluation (average)	2.12	2.67	2.40
Standard deviation	1.00	.90	.97
	Junior faculty		
Total returns	245	286	531
Number of faculty	3	15	18
Number of courses	5	17	22
Evaluation (average)	2.27	2.44	2.37
Standard deviation	.91	.95	.94
	Totals		
Total returns	444	503	947
Number of faculty	8	22	30
Number of courses	11	26	37
Evaluation (average)	2.20	2.54	2.38
Standard deviation	.96	.94	.96

Tablə 3. Confidential representation of departments and student evaluation. Only courses taught by Science and Engineering senior faculty, regardless of support status, are included.

Department	Number of courses evaluated	Number of student evaluations	Student evaluation		Percentage of faculty receiving external support
			Average	Standard deviation	
A	5	427	1.79	.83	80
B	3	367	1.89	.96	67
C	5	467	2.00	.76	60
D	11	335	2.24	.80	22

who had received faculty awards, because otherwise he could be readily identified. Table 2 shows a higher average rating of teacher effectiveness for the group receiving support than for the group receiving no support. This finding follows the pattern of Table 1 for the scientists and the social scientists.

Table 3 represents four departments each having three or more senior Science and Engineering faculty members. Here again, the data are consistent: the department having the highest percentage of faculty members receiving external support had the highest student ratings. The department with the lowest percentage of external support for its faculty members had the lowest student ratings.

Reexamination of some of the data reveals other interesting patterns. In reply to the question "Do the students regard senior or junior faculty as the better instructors?" the responses are mixed and inconclusive (see Table 1). In the Science and Engineering group, the senior faculty are rated higher, whereas in the Arts and Humanities the junior faculty have a slight edge. In the Social Science group there is a virtual tie.

Another question of interest concerns the size of classes taught by grant holders. The data of Table 1 indicate that the faculty members receiving external support generally have the larger classes, whereas those receiving no support generally have the smaller classes. This conclusion may be easily verified by dividing the total number of returns by the number of courses. These rank orders are shown to exist for the senior Science and Engineering group (an excellent barometer in this study) as well as for the totals.

Unfortunately, data bearing on other ancillary questions cannot be presented here because they would provide clues to the identity of the individuals concerned. Nevertheless, the following preliminary findings based on small but probably adequate samples may be reported. Students generally gave high ratings to those senior Science and Engineering faculty members receiving external support who (i) taught freshman courses, (ii) had honors such as membership in the American Academy of Arts and Sciences, or (iii) received unusually large amounts of support from the government. However, being the recipient of an award from a government agency is probably the important factor, rather than the amount of the award.

Observations and Discussion

There are many published reports in which the professional investigator or journalist claims to have had discussions or interviews with "tens" or even "hundreds" of students. However, in a thorough search of the literature we found only two reports of identifiable experimental procedures relating teacher effectiveness to a stated population base of student ratings. McGrath (*10*) reported that two-thirds of the outstanding teachers in 15 liberal arts colleges had published at least one article recently. Voeks (*11*) at the University of Washington found no difference in the teaching effectiveness of faculty members who published and those who did not. Only the statistical end results are provided in this latter report, and it is difficult to reconstruct the original data for comparison with the study discussed here. Nevertheless, the fact that both McGrath's and Voeks's reports indicate that publication is not associated with poor teaching performance is instructive. We found no reference to these two studies in any popular American magazine.

The Tufts data strongly suggest that the faculty members who publish have higher teacher-effectiveness scores than those who do not. Recently, Carroll (*13*) carefully distinguished between the product and the process values of university research. Perhaps, as he implies, too much emphasis has been given to a result of research—that is, publication—and not enough to what involvement in the research process contributes to the personal development of the faculty member. Many commentators (*3, 9, 10*) agree that research does not subvert good teaching. Instead, they believe, research supports good teaching, since it keeps the dissemination of obsolete knowledge to a minimum, encourages the introduction of new teaching methods, prevents professional stagnation, and encourages respect and enthusiasm for scholarship among the students.

Although many references are made in the professional education journals and in popular magazines and newspapers to the relationship between government awards and teaching capabilities (*3, 6, 8*), no investigations which test this relationship have been reported. Meanwhile, the Tufts University data indicate that the individuals who have sought and received government funds function exceptionally well as teachers, in the opinion of their students.

According to a recent report, a group at Case Western Reserve University is studying "the science of science" (*14*). One of the problems to be reviewed is the possible conflict, if any, between research and teaching. A definitive statement may emerge from this study.

A faculty awards program provides an excellent means of observing and evaluating the performance of new faculty members. The success of the Tufts faculty awards committee, over the past 5 years, in identifying faculty members of ability who have subsequently succeeded in obtaining external funds lends support to the view that universities and colleges could well distribute larger amounts of institutional and programmatic funds in an acceptable fashion.

What is needed is a large "prospective" study undertaken either by the U.S. Office of Education or the National Science Foundation, or by both working together, which, hopefully, could uncover patterns showing the genesis of our young and able researchers and teachers. Whatever observations are available at this time are retrospective; they necessarily start with the good researcher and good teacher and proceed backward.

We may now return to the original question: Is the faculty member who is interested in publishing and in acquiring funds for research and other means of personal development a poor teacher? The answer, according to our empirical data, is probably no—he is likely to be a better teacher.

Summary

Three bodies of available data at Tufts University were used in determining whether there are meaningful relationships between teaching effectiveness, publication, and the receipt of government support. A search of the literature showed that virtually all comments in the popular literature and most references in professional journals suggest that publication and receipt of support for research somehow detract from teaching performance in the classroom.

The empirical data of the Tufts study do not support these previous conclusions. The students rated as their best instructors those faculty members who had published articles and who had received or were receiving government support for research.

References and Notes

1. These and other contagious clichés have been widely used. For criticism, see (*2*) and (*3*).
2. W. R. Hutchison, *Amer. Scholar* **1966**, 430 (summer 1966).
3. J. R. Killian, *Atlantic Monthly* **1965**, 53 (Dec. 1965).
4. P. H. Abelson, *Science* **157**, 759 (1967).
5. *Sci. Newsletter* **88**, 328 (1965).
6. *Newsweek* **1966**, 75 (24 Oct. 1966).
7. R. H. Snow, *J. Higher Educ.* **34**, 318 (1963).
8. J. Fisher, *Harper's* **1965**, 18 (Feb. 1965).
9. H. A. Schmitt, *J. Higher Educ.* **36**, 419 (1965).
10. E. J. McGrath, *ibid.* **33**, 148 (1962).
11. V. Voeks, *ibid.*, p. 212.
12. P. J. Bryant, *ibid.* **38**, 326 (1967).
13. J. D. Carroll, *Science* **158**, 1019 (1967).
14. *Sci. Res.* **2**, 19 (Nov. 1967).

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NEWS AND COMMENT

Pollution: The Wake of the "Torrey Canyon"

London. When the tanker *Torrey Canyon* ran aground near the southwest tip of England last year, it gave its name to a new kind of maritime disaster, the cost of which is counted not in human life but in widespread economic and ecological damage. This in part accounts for the special efforts subsequently made to assess the implications of the accident. And while the last word has certainly not been said, two recently published British government reports contain much of what is likely to be learned about the effects of the wreck.

A review of events and a set of recommendations for future action are contained in a report* published late last year by the committee of scientists organized at the time of the crisis by Sir Solly Zuckerman, chief scientific adviser to the British government. Then, on the anniversary of the stranding itself, a report† based on a survey and analysis of the biological consequences of the wreck was published by the government-financed Plymouth Laboratory of the Marine Biological Association of the United Kingdom.

Taken together, the two reports offer a good account of the lessons learned. What is insufficiently suggested is the effect of the crisis atmosphere which prevailed in the days when oil was escaping from the stranded ship. As the Zuckerman committee notes, "most of the decisions taken during the crisis had a scientific and technical aspect." But a lack of relevant scientific information, the necessity of improvising a coordinated response to the emergency, and perhaps most of all the legal, political, and economic specters raised by the incident made it difficult to put countermeasures on a "scientific" footing.

The government was criticized, for example, for waiting a full 10 days before ordering an attempt by aerial bombing to burn oil still left in the tanker. First the government hoped the ship might be refloated or the oil might be transferred. Then there were doubts that the oil could be effectively released by bombing, ignited, and kept alight. And Britain, as a major maritime nation, was reluctant to take a step such as bombing while the salvagers held out hopes and so many questions about responsibility were unanswered.

Pollution of the English coast by oil is a perennial problem. What was unprecedented was the scale of pollution threatened by the *Torrey Canyon*, loaded with 117,000 tons of Kuwait crude oil. Exposed to the threat were the beaches of the southern coasts of England, Britain's principal holiday area. Very heavy pressure was immediately exerted to "save the beaches."

With first priority given to safeguarding coastal amenities, the reflex action was to employ measures developed by the Navy in dealing with oil spills in harbors. This meant using detergents to emulsify and disperse the oil. Some 10,000 tons (2 million gallons) of detergents were used to treat 13,000 tons of oil on Cornish beaches, and another half million gallons were sprayed at sea.

In its effects on marine life this detergent "cure" proved much more damaging than the oil itself. The chief conclusion of the Plymouth Laboratory study is that, except for serious effects on some species of sea birds, the oil was not lethal to flora and fauna. Detergents used to disperse the oil, on the other hand, were highly toxic to marine life, most conspicuously to intertidal life such as limpets and barnacles. In the open sea, detergents in quantities as small as one part of detergent per million parts of seawater proved lethal to planktonic growth.

Toxic Effects

Detergents used in spraying operations are mixtures of several compounds —a surfactant (or surface-active agent), an organic solvent, and a stabilizer. A stable emulsion of oil and water was necessary if the oil was to be dispersed. Solvents which enable the surfactants to mix with oil to form an emulsion contain a high proportion of aromatic hydrocarbons. Research indicated that the detergents with the highest proportion of aromatics are the best emulsifiers, and also the most toxic to flora and fauna.

Spraying of a half-million gallons of such detergent could be expected to have a devastating effect on plankton living near the surface of the water. Biologists reported surprisingly little damage to planktonic organisms in the spraying area. The explanation, they

* *The Torrey Canyon* (Her Majesty's Stationery Office, London, 1967). † J. E. Smith, Ed., *"Torrey Canyon" Pollution and Marine Life* (Cambridge Univ. Press, London, 1967).