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ABSTRACT

This report is the second of three volumes describing the results of the evaluation of the National Science Foundation (NSF) Local Course Improvement (LOCI) program. This volume describes the quantitative results of the program. Evaluation of the LOCI program involved answering questions in the areas of the need for science course improvement as perceived by college teachers, the profile of applicants for LOCI awards, appropriateness of program guidelines, and outcomes of LOCI projects. To answer these questions, data were collected using several different methods and populations. This volume presents the results from a survey of a national sample of teachers of undergraduate science and engineering on needs for local course improvement, presents the profile of applicants for LOCI awards, describes LOCI award recipients and their projects, describes the responses of project directors and department chairpersons to LOCI project outcome questionnaires, and describes LOCI outcomes as indicated by project directors in their final reports. (GS)

Evaluation of the National Science Foundation's Local Course Improvement Program

Volume II

Quantitative Analyses

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Chapter 1

Introduction

This report presents the results of quantitative analyses undertaken as part of a comprehensive evaluation of NSF's Local Course Improvement (LOCI) program. The report is the second in a three-volume set describing results of the evaluation. The first volume presents an overview of the evaluation and provides a summary of all project results. The third volume describes detailed findings from site visits to institutions that received LOCI awards.

LOCI is one of a number of programs through which NSF's Division of Science Education Resources Improvement provides support to strengthen the capabilities of schools, colleges, and universities for science education and research training. LOCI helps colleges and universities improve their science instructional efforts at the level of individual courses or small groups of courses. The program provides up to two-thirds of the total cost of a project for maximums of $25,000 and two years. In 1976 LOCI received 169 proposals and funded 66, with an average award of $13,600. In 1977 the program received 750 proposals and funded 129, with an average award of $17,000. In 1978 it received 453 proposals and funded 135, with an average award of $16,700.

In July 1977 NSF requested proposals from educational institutions and research centers for the evaluation of its LOCI program. The request for proposals specified a project that would answer questions in several areas:

1) Need for support for local course improvement--What evidence exists that institutions need outside assistance to keep up with currently important scientific and instructional developments? How do needs differ in different types of institutions and in different scientific fields?

2) Response to LOCI--Do applicants for awards represent the full range of institutions and scientific fields? Are proposals and funded projects consistent with established needs for instructional improvement?

3) Outcomes of LOCI program--To what extent do projects achieve their objectives? Which sorts of objectives are most often achieved? What factors within projects contribute to their success? What are the most promising practices that have been developed in LOCI projects?

4) Program rationale--Are program guidelines and restrictions reasonable? Are level of support, degree of structure, and time allotted adequate? What other alternatives are there?

On the basis of our response to this request for proposals, we received a preliminary award to plan an evaluation of the LOCI program in September 1977. On the basis of the plan we submitted in January 1978, we received an award to carry out a comprehensive evaluation. The project was carried out in the period of September 1978 through March 1980.

To answer the questions posed by NSF, we collected data using several different methods with several different populations. To draw conclusions about the need for local course improvement, for example, we contacted a representative sample from the total population of

teachers of undergraduate science and engineering. To determine whether the existing LOCI program was responsive to perceived needs, we used NSF documents to construct profiles of proposers and of award recipients, and we compared these to a national profile of college science teachers and to the picture of needs developed in the first part of the project. To determine whether program guidelines were appropriate, we read, classified, and analyzed proposals funded by NSF during the years 1976 through 1978. To evaluate outcomes of LOCI projects, we analyzed questionnaire responses and final reports from directors of completed projects. We also made site visits to a representative sample of these projects.

This volume reports all results except those obtained during the site visits. Chapter 2 presents the results from the survey of a national sample of college science teachers on needs for local course improvement. Chapter 3 presents the profile of applicants for LOCI awards. Chapter 4 gives a description of recipients of awards and also describes their LOCI projects. Chapter 5 describes responses of project directors and chairpersons of their departments to questionnaires on LOCI project outcomes, and chapter 6 describes the LOCI outcomes that project directors documented in their final reports to NSF.

Chapter 2

Needs and Resources in College Science Teaching

The first goal in our evaluation of the LOCI program was to determine whether college science teachers could keep up with currently important scientific and instructional developments without outside help. Do college teachers think science courses need improvement? Do they think that resources like those provided by LOCI actually help improve teaching? Are resources like those LOCI provides available to science teachers from their own colleges and universities? Do needs and resources differ in different types of institutions and in different scientific fields?

This chapter gives our answers to such questions. It reports the results of a survey of opinions of a national sample of college science teachers. The survey covered three areas: needs in college science teaching; effectiveness of various resources in improving instruction; and availability of these resources locally.

Method

Questionnaire

The questionnaire developed for this survey contained nine items on needs and six items on resources in college science teaching (Appendix A). The questionnaire also asked faculty members to provide information about themselves--highest degree, academic field, rank, and recent undergraduate teaching responsibilities. The questionnaire was designed to require no more than 5 to 10 minutes for completion.

The nine items on needs in science teaching fell into three groups: need for course and curricular revision; need for revision of teaching methodology; and need to improve educational outcomes in such areas as student achievement, student satisfaction, number of enrollments, number of dropouts, and service to adults in the community. For each of the nine items, respondents were to indicate degree of need on a four-point scale: strong need, moderate need, slight need, or no need at all.

The six resources listed in the questionnaire were: released time, summer salary, travel funds, small teaching grants, consultation, and paid assistants. Respondents were asked to indicate the effectiveness of each of these resources on a four-point scale: high in effectiveness, medium, low, or not at all. Respondents were also asked to indicate the availability of each of the resources on a four-point scale: high in availability, medium, low, or not at all available.

Sample

The questionnaire was mailed to a national sample of college science teachers in May of 1979. The initial mailing was to 2649 teachers, about 1/60th of the science teachers listed in the National Faculty Directory (Gale Publishing, 1978). Completed questionnaires were returned by 833 of these individuals. An additional 130 questionnaires were returned to us, either unopened or without responses, by the post office or the individuals who had received them. Envelopes returned by the post office bore various notations: inadequate address or addressee unknown, deceased, or left the institution without leaving a forwarding address. Questionnaires

without responses returned by individuals contained other explanations: retired or not a teacher of undergraduate science. We made no further attempt to get responses from individuals who were not at institutions listed in the Faculty Directory or who were not currently teachers of undergraduate science.

In November of 1979 we sent a second copy of this questionnaire to the 1686 individuals who did not respond to the first mailing. Two weeks after the mailing of this questionnaire, we sent out reminder postcards to all nonrespondents. The second mailing yielded an additional 429 completed questionnaires for the analysis. Of the teachers of undergraduate science successfully contacted by us in the two mailings, a total of 1262 (or 50.1%) returned questionnaires.

Adequacy of the Sample

To determine whether the individuals returning questionnaires were representative of the sample surveyed, we carried out two major analyses. The first compared characteristics of respondents and nonrespondents to the questionnaire. The second compared responses of the individuals who filled out the first questionnaire with responses of individuals who delayed answering until receiving a second questionnaire.

The comparison of respondents and nonrespondents focused on institutional and departmental affiliations of the two groups. We first classified the institutions of all individuals in the total sample according to level and control, based on data available from the National Center for Education Statistics (Pepin, 1978). We then classified the departmental affiliations of these teachers using three dimensions developed by Biglan (1973): pure vs. applied; hard

vs. soft; and life vs. non-life. In Biglan's taxonomy, engineering and computer science are applied sciences; psychology and the physical, mathematical, biological, social, and environmental sciences are pure sciences. Psychology and the social sciences are soft; the others are hard sciences. Biology, psychology, and the social sciences are life sciences; other sciences are non-life.

The results of chi-square tests comparing respondents and nonrespondents appear in Table 1. Neither level nor control of institution was related to return of questionnaire. Individuals at public and private institutions and at two-year colleges, four-year colleges, and universities were equally likely to return questionnaires. Departmental characteristics, however, were related to return of the questionnaire. Teachers in psychology and the social sciences were less likely to return questionnaires so that the soft sciences and the life sciences were somewhat underrepresented among our respondents.

Further analyses suggested, however, that the underrepresentation of psychologists and social scientists among respondents did not seriously damage the generalizability of our results. These analyses showed that responses of psychologists and social scientists to our questionnaire items were indistinguishable from responses made by other science teachers. A healthier response from psychologists and social scientists or a less hearty response from other science teachers would not have changed the overall picture of needs and resources.

Our second major analysis compared responses of those filling out the first questionnaire and those filling out the second questionnaire. There was little difference in the answers of the two groups. The average response to the need items, for example, was 2.8 for those responding to the first mailing, and was also 2.8 for those responding to the second mailing. The average response on resource effectiveness items was 3.0 for the first mailing, and also 3.0 for the second mailing. The same pattern occurred on resource availability items: an average score of 1.8 for each of the mailings.

The implication of this analysis seemed clear to us. Those who responded immediately to our request for information did not differ in their perceptions of science teaching from those who responded only after prompting with another questionnaire and postcard. Likelihood of responding did not seem related to perceptions of needs and resources in science teaching. This analysis gave us some confidence in generalizing our findings from respondents to the total population contacted by us. We could find no reason for believing that needs of nonrespondents were more or less pronounced than the needs of those who did respond.

Results

Overall Needs and Resources

In this part of the analysis, we examined overall perceptions of needs in science teaching, resource effectiveness, and resource availability.

Needs. Respondents generally reported strong or moderate needs to improve the content, teaching methodology, and effectiveness of science teaching at their institutions (Table 2). The number that

reported strong needs was especially striking. Fully one-quarter of all college science teachers said that courses in their departments strongly needed revision in content or teaching methodology and that teaching in their departments needed to be improved in effectiveness. Another third of the respondents reported moderate needs in these areas. A minority of teachers reported slight or no need for improvement of science instruction.

The teachers that we contacted gave almost equal emphasis to the need for updating content and the need for revising teaching methods in science teaching. Respondents who reported an urgent need to update course content made written comments like these:

> There is an overall need to (1) bring in developments in archeology, human origins, ethology, and social modelling, and (2) to re-state them in a reliable, concise, and intelligible way. The general educational significance of modern anthropology must be carefully maintained without being swallowed by technique or fragmented--and this is difficult. Here is a valid area for NSF projects. (From a teacher of anthropology at a public university.)

> Physics and chemistry are in need of reexamination. Stars probably do not generate radiant energy by fusion; the atom probably is not made of elementary particles and has no nucleus; physical entities go faster than "light" not in space but in time, etc. (From a teacher of physics at a four-year college.)

Some of the teachers who emphasized the need for revision of teaching methodology commented on the difficulties in using instructional technology:

> Optimum use of instructional technology takes LOTS of preparation time. An effective establishment of one good course's worth of existing technologies would take AT LEAST a year's fulltime work before the start of the course, and another year or two of debugging in use. After that, updating and revising would be no more of a load than preparation and updating any ordinary course. Naturally, we don't get that kind of support--so we've never made properly effective use of the technological tools we've got. Problem is as much one of software as hardware. (From an anthropology teacher at a public, four-year college.)

Many respondents reported a need to improve the effectiveness of science teaching, but they did not agree completely about which outcomes needed improvement. There was most agreement about the need to increase student mastery of scientific concepts. Over 50% of science teachers reported a strong need for increasing student achievement, and an additional 33% reported a moderate need. There was least agreement about the need to increase enrollments and decrease dropouts. As many respondents reported strong needs to increase enrollments or decrease dropouts as reported no need at all.

Written comments reflected the split in opinion on enrollments and dropouts. Some teachers identified enrollments and dropouts as key concerns:

> We are losing far too many high school students. (From a teacher of sociology at a public, two-year college.)

> There is a strong need to reach more students with new ideas and developments in science. But this must be done with maximum effectiveness, to keep costs as low as possible. (From a physics teacher at a public, four-year college.)

Others did not see any problems in the area of enrollments and dropouts:

> A need to increase enrollment? For what purpose? (From a teacher of mathematics at a public, two-year college.)

> If good students dropped out or poor students who could be helped dropped out, I would favor decreasing dropouts. I see no reason to retain those who fail to achieve because of laziness. (From a biology teacher at a public, four-year college.)

Several teachers wrote that the nine items listed in our questionnaire overlooked an important need in science teaching today:

> There is also a need for a science core requirement to insure reasonable sophistication in modern science for liberal arts students. (From a psychology teacher at a public university.)

> Item 10 and very strongly needed: Developing a coherent program to provide non-science liberal arts students with a degree of literacy and competence in mathematics and the sciences, with understanding of science as a highly selective way of viewing the world, and with appreciation of the perspective thus provided. (From a mathematics teacher at a private, four-year college.)

Resource effectiveness. Most respondents reported that resources like those provided by the LOCI program are effective in improving instruction (Table 3). The resources that received the highest ratings were provision of summer salary and released time. Nearly half the respondents to the questionnaire rated released time or summer salary as highly effective ways of improving science teaching. Small grants to support teaching effectiveness seemed almost as effective to respondents to the questionnaire. Over a third of the science teachers rated small teaching grants as high in effectiveness. Ratings were more moderate for travel funds, paid assistants, and consultants on teaching improvement. About half of the respondents to the questionnaire rated these resources as medium in effectiveness.

Written comments of teachers about these resources explained their ratings. Many of the comments emphasized the importance of additional time for course improvement:

> At this time of declining enrollments our college should—but doesn't--give released time for course revision, course attendance, seminar participation. We need—at the community college level--to convince the governing board of the merit of retraining and upgrading of skills and information. (From a sociology teacher at a public, two-year college.)

> At an institution such as this, where teaching is considered marginally more important than research (and one can argue that such an institution provides the most fertile ground for genuine advances in science teaching) the conflict between time spent on teaching and time spent on research is intense. Thus the extreme importance and effectiveness of released time for working on course improvement. (From a teacher of mathematics at a private, four-year college.)

Although most teachers said that more time and more resources were needed for teaching improvement, a minority of teachers wrote that additional resources were not needed. Some of these teachers wrote that additional resources were far less important than the dedication, initiative, and quality of the teacher:

> A dedicated teacher will do most of the above with no help or guidance. Some who regard teaching and the continual effort to improve teaching with less dedication may need many of the above helps and prods It could be useful in improving the quality of an average teacher or even good teacher--not necessarily the dedicated professional teacher. (From a biology teacher at a public, four-year college.)

> Personal initiative is more important than any of the above. (From an economics teacher at a private university.)

Others explained that attitudes of administrators toward teaching and rewards for good teaching were more important than institutional resources:

> To improve teaching, create incentives to reward excellent teachers and punish mediocrity (not just horrendous teaching). The incentives to use resources to improve teaching are not present. Resources to improve research productivity are used because the incentive structure provides clear rewards. Improvements in teaching must take time away from publishing. So, why improve teaching? (From a teacher of political science at a public university.)

> The real problem is we are a "publish or perish" institution. Only research productivity counts for survival. Good teaching might help only as a selection criterion among "matched" high publishers. Good teaching requires preparation, time and work. Until these are not only provided, but rewarded, there will not be any improvement. (From a teacher of psychology at a public, four-year college.)

Finally, a few teachers suggested that other resources were just as important as those included on our list. Important additional resources listed by respondents included funds for equipment:

> Most course improvements in chemistry must center on equipment or access to equipment--e.g., computers, spectrometers, etc. with acquisition costs in the $5,000-$50,000 range. It seems to me that NSF's approach has been schizoid--programs for instruction

> and others for instructional equipment. When we revise a course the costs are mostly in hardware not staff planning time. I believe this is true of small schools in general. Chemical education needs $$$ for instrumentation more than any other thing. (From a chemistry teacher at a private four-year college.)

Other respondents wrote that institutes could play a large role in improving undergraduate science teaching:

> Summer institutes ("refresher" courses or "new subarea" courses) plus small scale research opportunities (either independent or affiliated with larger projects) are of great importance to teaching-oriented undergraduate faculty. (From an anthropology teacher at a private, four-year college.)

> If NSF really wants to help, they should reinstitute the summer NSF Institutes. Many would attend without any stipend if tuition, fees, travel, room and board were provided. (From a biology teacher at a public, two-year college.)

Resource Availability. Survey respondents reported that resources like those LOCI provides were either unavailable or low in availability at their institutions (Table 4). Interestingly enough, the two items reported to be least available were those considered most effective by respondents: summer salary and released time. Nearly two-thirds of all respondents said that summer salary was "not at all" available for teaching improvement projects; nearly half of all respondents said that released time for such work was unavailable during the academic year. Other items (i.e., travel funds, small teaching grants, consultation, and paid assistants) were available to more respondents, but overall were still low in availability.

Written comments from teachers in all fields and in all types of institutions emphasized the lack of resources for teaching improvement:

> Our department barely has enough funds for instruction and secretarial support and almost none for new equipment. Resources for teaching improvement are almost nonexistent. (From a teacher of electrical engineering at a public university.)

> Difficulties in trying to do teaching and research in a graduate degree granting institution are not recognized. Everyone would like to improve their teaching, but no incentives are available in terms of time or money to do it and students are becoming more and more demanding. (From a geology teacher at a public university.)

> Funding is so severely limited in community college districts in this state that upgrading of courses is entirely dependent on the enthusiasm of the instructor. (From a biology teacher at a public two-year college.)

> At this university teaching improvement etc. has been done on a catch-as-catch-can basis. There has never been any realistic support for teaching innovation, although such is to be desired. (From a chemistry teacher at a public university.)

Some written comments stressed time pressures that faculty face today. Many teachers said that they needed time to plan and revise courses, and that released time was not available at their institutions:

> What I need most is released time. Our undergraduate chemical engineering enrollments are very large, and increasing 30% per year. We simply cannot find the qualified faculty needed to effectively handle this load. Also, for some reason we do not have many paid TA positions in our department. The result of all of this is a very busy academic year for our faculty. (From a teacher of chemical engineering at a public university.)

> We have 15 credit hour (or equivalent) teaching loads at this institution. With such heavy loads, few people have much time to even think, much less contemplate improvements. Thus only during the summer is it at all practical to plan improvements. Nonetheless, few people devote their summers to such activity. Most take other employment. (From a physics teacher at a public, four-year college.)

Differences among Institutions and Fields

In this part of the analysis, we tried to determine whether perceptions of needs and resources were different at different types of institutions and in different fields.

Needs. The nine need items in the first part of the questionnaire correlated highly with each other, and factor analysis showed that a single factor ran through the items and explained the high intercorrelations. We felt justified, therefore, in summing together all scores on the need items to obtain a total need score. The alpha-reliability of the total need score was .69. We used stepwise multiple regression to determine whether total need scores differed at different types of institutions and in different fields. Level of institution turned out to be related to perceived needs. The correlation between institutional level and perceived need was .22. Perceived needs were highest at community colleges (mean item endorsement = 3.0), lower at four-year colleges (mean = 2.8), and lowest at universities (mean = 2.6). Other institutional and departmental characteristics were not related to perceived needs for instructional improvement.

Resource Effectiveness. The six items on perceived effectiveness of resources also correlated highly with one another, and again we found that one common factor ran through these items. We therefore summed all scores on the effectiveness items to obtain an overall effectiveness scale score for each respondent. The alpha-reliability of this overall scale score was .76. Institutional level again turned out to be the factor most strongly related to scale score. The correlation between institutional level and perceived resource effectiveness was .16. Resources were perceived as most effective at two-year institutions (mean item endorsement = 3.1) and at four-year colleges (mean = 3.1); resource scale scores were somewhat lower at

universities (mean = 2.9). Other institutional and departmental characteristics were not significantly related to perceived effectiveness of resources.

Availability. Based on the results of a third factor analysis, we summed together scores on the six items on availability of instructional resources. The alpha-reliability of the overall availability scale was .69. Regression analysis failed to uncover any institutional or departmental characteristic significantly related to availability scale score.

Other Differences

In our final analysis, we tried to determine whether individual characteristics of respondents were related to their perceptions of needs and resources. The five characteristics of respondents that we examined were: highest degree, academic rank, chairperson status, administrator status, and whether or not the respondent taught undergraduate courses in the past year. We used stepwise multiple regression to determine whether these characteristics had an influence on questionnaire responses after we controlled for effects of institutional level. Results were clearcut. Although individual characteristics could be used to increase predictability slightly, the amount of variation explained by these characteristics was trivial in a practical sense. Responses of groups with different degrees, at different ranks, and with different amounts of undergraduate teaching were virtually indistinguishable.

Summary and Conclusions

The college science teachers we contacted generally reported strong or moderate needs to improve the content, teaching methodology, and effectiveness of science teaching at their institutions. Fully one-quarter of all college science teachers said that courses in their departments strongly needed revision in content and teaching methodology and that teaching in their departments also needed to be improved in effectiveness. Another third of the survey respondents reported moderate needs in these areas. A minority of teachers reported slight or no need for improvement of science teaching.

The teachers we contacted did not assign different priorities to revising teaching methods and updating content of science courses. Both tasks seemed important to them. But respondents did stress some educational outcomes more than others. They reported that the greatest need was to increase student learning, but they also reported a strong need to increase student satisfaction in science courses. They gave somewhat lower priority to increasing enrollments and community service and decreasing course dropouts.

According to these teachers, resources of the sort provided by the LOCI program are effective in improving instruction. The resources that received the highest ratings were provision of summer salary and released time. Nearly half the respondents to the survey questionnaire rated released time or summer salary as highly effective in improving science teaching. Small grants to support teaching effectiveness seemed almost as effective to respondents to the questionnaire. Ratings were more moderate for travel funds, paid assistants, and consultants on teaching improvement.

Teachers in our survey said, however, that these items were either unavailable or low in availability at their colleges and universities. The two items reported to be least available were those considered most effective by respondents: summer salary and released time. Nearly two-thirds of all respondents said that summer salary was "not at all" available for teaching improvement projects; nearly half of all respondents said that released time for such projects was unavailable during the academic year. Other items (i.e., travel funds, small teaching grants, consultation, and paid assistants) were available to more respondents, but overall were still considered low in availability.

Perceptions of needs and resources were somewhat different at different institutions. Perceived needs were highest at community colleges, lower at four-year colleges, and lowest at universities. Resources of the type LOCI provides were perceived as most effective by teachers at community colleges and four-year colleges, and were seen as somewhat less effective by faculty members at universities. Availability of these resources was reported to be equally low by teachers at all levels of institutions.

Perceived needs and resources were very similar in different areas of science. Teachers in hard and soft, pure and applied, life and nonlife sciences reported similar degrees of need and similar perceptions of resources in college science teaching. Individual characteristics of teachers also were unrelated to perceptions of needs and resources. Groups of respondents with different degrees, at different ranks, and with different undergraduate teaching responsibilities gave similar responses to our survey questions.

TABLE 1

CHARACTERISTICS OF RESPONDENTS AND NONRESPONDENTS TO THE NEEDS QUESTIONNAIRE

Characteristic	Respondents		Non-respondents		Chi-Square	Sig.
	N	%	N	%		
Control of Institution						
Public	901	71.4	902	71.8	0.04	ns
Private	361	28.6	355	28.2		
Level of Institution						
University	427	33.8	420	33.4	1.95	ns
Four-Year	610	48.3	586	46.6		
Two-Year	225	17.8	251	20.0		
Pure vs. Applied Sciences						
Pure	1092	88.0	1093	88.5	0.15	ns
Applied	149	12.0	142	11.5		
Hard vs. Soft Sciences						
Hard	885	71.3	736	59.6	37.60	.001
Soft	356	28.7	499	40.4		
Life vs. Nonlife Sciences						
Life	572	46.1	675	54.7	18.16	.001
Nonlife	669	53.9	560	45.3		

TABLE 2

SCIENCE TEACHERS' RATINGS OF EDUCATIONAL NEEDS

Item	No Need At All (1)		Slight Need (2)		Moderate Need (3)		Strong Need (4)		Mean
	N	%	N	%	N	%	N	%	
Updating Course Content	79	6.4	353	28.5	514	41.6	291	23.5	2.82
More Technology	120	9.7	384	30.9	434	35.0	303	24.4	2.74
More Individualization	197	16.0	453	36.7	377	30.5	208	16.8	2.48
Updating Programs	114	9.3	395	32.3	462	37.7	253	20.7	2.70
More Student Mastery	26	2.1	129	10.5	410	33.3	667	54.1	3.39
More Satisfaction	52	4.2	341	27.7	551	44.8	286	23.3	2.87
More Enrollments	265	21.5	253	20.6	309	25.1	403	32.8	2.69
Fewer Dropouts	239	19.4	362	29.3	338	27.4	295	23.9	2.56
More Community Service	126	10.3	298	24.3	449	36.7	351	28.7	2.84

TABLE 3

SCIENCE TEACHERS' RATINGS OF THE EFFECTIVENESS OF EDUCATIONAL RESOURCES

Item	Not At All (1)		Low (2)		Medium (3)		High (4)		Mean
	N	%	N	%	N	%	N	%	
Released Time	54	4.4	176	14.4	479	39.1	515	42.1	3.19
Summer Salary	69	5.7	129	10.7	459	38.0	552	45.7	3.24
Travel Funds	90	7.4	320	26.1	531	43.4	283	23.1	2.82
Small Teaching Grants	38	3.1	159	13.0	555	45.5	469	38.4	3.19
Consultation	98	8.1	379	31.3	522	43.2	210	17.4	2.70
Paid Assistants	73	6.0	248	20.3	535	43.9	363	29.8	2.97

TABLE 4

SCIENCE TEACHERS' RATINGS OF THE AVAILABILITY OF EDUCATIONAL RESOURCES

Item	Not At All (1)		Low (2)		Medium (3)		High (4)		Mean
	N	%	N	%	N	%	N	%	
Released Time	594	48.1	463	37.5	154	12.5	23	1.9	1.68
Summer Salary	777	63.7	326	26.7	85	7.0	32	2.6	1.49
Travel Funds	491	40.0	543	44.3	168	13.7	25	2.0	1.78
Small Teaching Grants	373	30.5	561	45.9	245	20.0	44	3.6	1.97
Consultation	404	33.4	537	44.3	219	18.1	51	4.2	1.93
Paid Assistants	512	41.7	454	36.9	212	17.2	51	4.1	1.84

Chapter 3

Applicants for LOCI Awards

The next major goal in the evaluation of the LOCI program was to determine whether proposals came from a representative sample of institutions and fields. Did applicants for LOCI awards represent the full range of institutions and scientific fields? Or were certain types of institutions and fields unrepresented or underrepresented in LOCI proposals? Did certain institutions and fields submit more than their share of proposals?

To answer such questions, we first classified the proposals submitted to the LOCI program by institutional type and scientific field. We then compared the number of proposals received from each type of institution and field with the number expected on the basis of population characteristics. This chapter presents the results of these comparisons.

Methods

Lists of proposals submitted during the period 1976-78 were examined for this study. The lists contained identifying data on the 1358 proposals received by NSF during this period: 163 proposals in 1976; 742 proposals in 1977; and 453 proposals in 1978. Included on the lists were names of institutions submitting proposals and departmental affiliations of proposed project directors.

We first classified institutions submitting proposals according to their level, control, and traditional background at the institutions:

a) Level--We used the classification published by the National Center for Education Statistics (Pepin, 1978) to describe institutions according to level. Institutions were classified as either universities, four-year colleges, or two-year colleges.

b) Control--We again used Pepin's (1978) published classification to describe institutions as either public or private.

c) Traditional racial background of institution--A list of traditionally black institutions, compiled at the National Center for Education Statistics (Turner and Michael, 1978), was the basis for our classification of institutions as either traditionally black or other.

We also described the scientific field and area of each proposal, using both traditionally defined fields and three dimensions defined by Biglan (1973). These dimensions were:

a) Pure vs. applied--In Biglan's taxonomy, engineering and computer science are applied; psychology and the physical, mathematical, biological, social, and environmental sciences are pure sciences.

b) Hard vs. soft--Psychology and the social sciences are soft sciences; the others are hard sciences.

c) Life vs. nonlife--Biology, psychology, and the social sciences are life sciences while other sciences are nonlife sciences.

Results

Changes in Source of Proposals over Time

Table 5 presents institutional and departmental characteristics of proposals for LOCI funding submitted in 1976, 1977, and 1978. Although the absolute number of proposals changed a good deal in the three years, the percentage of proposals coming from each type of school and each scientific area remained fairly constant over the three-year period. There was no evidence of a dramatic increase or decrease over time in proposals from certain types of institutions or scientific areas. This consistency in source of proposals provided the basis for the aggregate analyses presented in the rest of this report.

Institutional Level

Proposals to LOCI came from institutions at all levels--from major research universities, comprehensive state colleges, private liberal arts colleges, community colleges, and special institutions. And each level of institution submitted a substantial number of proposals. During 1976-78, universities submitted 511 proposals (or 37.6% of all proposals); four-year colleges submitted 736 (or 54.2% of the total); and two-year colleges submitted 111 proposals (or 8.2% of the total).

Was the number of proposals submitted by each level of institution consistent with the role played by the institution in undergraduate education? To answer this question, we needed to know how large a role each type of institution played in undergraduate education in this country. The simplest and perhaps most satisfactory index of institutional contribution to undergraduate education is the

total undergraduate enrollment at the institutional type. We used data from the National Center for Education Statistics (Pepin, 1978) on undergraduate enrollment at each institutional level to determine the number of proposals that might be expected from universities, four-year colleges, and two-year colleges.

Table 6 compares the actual number of proposals submitted by each type of institution to the number expected from nationwide enrollment figures. The table shows that there was a clear relation between level of institution and number of proposals submitted. Universities and four-year colleges submitted more proposals than expected; community colleges submitted far fewer. The number of proposals submitted by community colleges seems in fact too small to ignore. In recent years more than one-third of all undergraduates were enrolled at community colleges. Yet only one-twelfth of all proposals came from this source. To bring the number of proposals received from various types of institutions into line with the role played by the institutions in undergraduate education, it would be necessary to quadruple the number of proposals submitted by community colleges--going from 37 proposals per year to 148 per year.

In the preceding chapter, we learned that the need for instructional improvement was reported to be greatest at community colleges, less at four-year colleges, and least at universities. Community college teachers also perceived resources of the type LOCI provides to be very effective. The lack of response of community college teachers to the LOCI program cannot therefore be explained by a lack of need at these institutions or by a lack of faith in the sorts of resources LOCI can provide. Clearly, other factors must

explain the low response from community colleges. Among the possibilities worth considering are: less knowledge about and familiarity with NSF programs, less background in preparing proposals, and less confidence in ability to secure NFS funding.

Institutional Control

Private institutions submit well over one-third of all LOCI proposals (Table 7). These institutions, however, account for only one-fifth of all undergraduate enrollments (Pepin, 1978). Private institutions therefore submit more than their share of LOCI proposals. It is important to note, however, that at the two-year and at the university level, private and public schools do not differ much in likelihood of submitting proposals. In four-year colleges, however, private institutions are overrepresented and public institutions are underrepresented in LOCI proposals.

Traditional Racial Background of the Institution

Traditionally black institutions of higher education submitted proposals for LOCI funding in each year of the program (Table 8). To determine whether these schools submitted proposals in adequate numbers, we turned to Turner and Michael's (1978) statistical portrait of these institutions. These authors reported that the enrollment in traditionally black institutions in 1976 was 212,118, or 1.9 percent of the total enrollment in higher education in that year. The number of proposals from traditionally black schools--35 or 2.6 per cent of all proposals--therefore seems consistent with the role that these institutions are currently playing in higher education in this country.

Scientific Fields

LOCI proposals came from all scientific fields--from biologists, chemists, engineers, computer scientists, psychologists, mathematicians, economists, anthropologists, geologists, and many others. They came from pure and applied scientists, from those in life and nonlife areas, and from scientists in "hard" and "soft" disciplines. The range of departmental affiliations of individuals applying for LOCI funds was remarkably broad.

Did any of the fields submit more or less than their share of LOCI proposals? Or did a representative group of science teachers develop proposals for LOCI funding? To find out, we had to determine the proportion of college teachers in each of the fields. We used two sources to estimate these proportions. Our first set of estimates came from a large representative sample of faculty members whose names and departmental affiliations we drew from the National Faculty Directory (Gale Publishing, 1978). A second set of estimates came from NSF report listing the number of scientists and engineers at institutions of higher education in this country (National Science Foundation, 1977).

Table 9 presents a comparison of the number of proposals actually submitted from each scientific field with the number expected from the field. The table shows that the proposals clearly did not come from a representative sample of fields. The physical sciences, mathematics, computer sciences, and engineering submitted a disproportionate share; the biological and social sciences and psychology submitted fewer proposals than expected. Table 10 presents a comparison in terms of scientific areas. The table shows that teachers from "hard," nonlife,

and applied sciences submitted more LOCI proposals than expected on the basis of their representation on college faculties; science teachers from "soft," life, and pure sciences submitted fewer proposals than expected.

Summary and Conclusions

Proposals for LOCI projects came to NSF in large numbers during the years 1976 through 1978. The Foundation received 163 proposals for awards in 1976, 742 proposals in 1977; and 453 proposals in 1978. These proposals came from a variety of institutions. Proposals came from major research universities, state colleges, private liberal arts colleges, community colleges, and other institutions; from traditionally black and other institutions; and from every scientific discipline.

We did not study the record of other NSF funding programs, but we doubt that many of them could equal the record of the LOCI program in the diversity of applicants. The LOCI program seemed to get a response from all segments of higher education and from all areas of science. The program's broad appeal would seem to make it a valuable one to NSF. Through this program, the Foundation makes contact with old friends in higher education--teachers at major research universities--and also makes new friends at colleges not traditionally involved in scientific research.

Although LOCI proposals came from diverse sources, individuals submitting proposals did not fully represent the population of eligible college science teachers:

a) Universities and four-year colleges submitted more proposals than their undergraduate enrollments warranted; community colleges submitted far fewer than their share of proposals. In recent years, for example, more than one-third of all undergraduates were enrolled at community colleges. Yet only one-twelfth of all proposals came from this source.

b) Private institutions also submitted more than their share of proposals. These institutions accounted for about one-fifth of all undergraduate enrollments recently, but well over one-third of all proposals came from private schools.

c) The physical sciences, mathematics, computer sciences, and engineering submitted a disproportionate share of the proposals; the biological sciences, social sciences, and psychology submitted fewer proposals than expected.

Those institutions and fields submitting more than their share of proposals were not those with the greatest needs or fewest resources. Community college teachers in fact reported stronger needs for instructional improvement and greater confidence in the effectiveness of resources of the sort LOCI provides than did teachers at other institutions. The institutions and fields submitting more than their share of proposals rather seemed to be those with the strongest traditional links to NSF. Although the LOCI program may help NSF extend its services to a broader audience, even this program does not reach a completely representative audience of eligible college science teachers.

TABLE 5

CHARACTERISTICS OF INSTITUTIONS AND DEPARTMENTS SUBMITTING LOCI PROPOSALS --BY YEAR OF PROPOSAL

Characteristic	1976		1977		1978		Chi-Square	Sig.
	N	%	N	%	N	%		
Control of Institution								
Public	100	61.4	491	66.2	263	58.1	8.12	.025
Private	63	38.6	251	33.8	190	41.9		
Level of Institution								
University	60	36.8	289	38.9	162	35.8	6.94	ns
Four-Year	92	56.4	382	51.5	262	57.8		
Two-Year	11	6.7	71	9.6	29	6.4		
Racial Tradition								
Traditionally Black	5	3.0	16	2.2	14	3.1	0.99	ns
Other	158	96.9	726	97.8	439	96.9		
Pure vs. Applied Sciences								
Pure	129	83.2	524	76.3	333	78.4	3.65	ns
Applied	26	16.8	163	23.7	92	21.6		
Hard vs. Soft Sciences								
Hard	137	88.4	57.4	83.6	363	85.4	2.50	ns
Soft	18	11.6	113	16.4	62	14.6		
Life vs. Nonlife Sciences								
Life	43	27.7	206	30.0	124	29.2	0.33	ns
Nonlife	112	72.3	481	70.0	301	70.8		

TABLE 6

ACTUAL NUMBERS OF LOCI PROPOSALS SUBMITTED
BY THREE LEVELS OF INSTITUTION
COMPARED TO EXPECTED NUMBERS

Level of Institution	LOCI Proposals		Expectation Based on Total Undergraduate Enrollment	
	N	%	N	%
University	511	37.6	334	24.6
Four-Year	736	54.2	538	39.6
Two-Year	111	8.2	486	35.8

TABLE 7

ACTUAL NUMBERS OF LOCI PROPOSALS SUBMITTED
BY PUBLIC AND PRIVATE INSTITUTIONS
COMPARED TO EXPECTED NUMBERS

Control of Institution	LOCI Proposals		Expectation Based on Total Undergraduate Enrollment	
	N	%	N	%
Public Institutions	854	62.9	1059	78.0
University	402	29.6	248	18.3
Four-Year	348	25.6	345	25.4
Two-Year	104	7.7	466	34.3
Private Institutions	504	37.1	299	22.0
University	109	8.0	86	6.3
Four-Year	388	28.6	193	14.2
Two-Year	7	0.5	20	1.5

TABLE 8

ACTUAL NUMBERS OF LOCI PROPOSALS SUBMITTED BY TRADITIONALLY BLACK AND OTHER INSTITUTIONS COMPARED TO EXPECTED NUMBERS

Racial Tradition	LOCI Proposals		Expectation Based on Enrollment	
	N	%	N	%
Traditionally Black	35	2.6	26	1.9
Other	1323	97.4	1332	98.1

TABLE 9

ACTUAL NUMBERS OF LOCI PROPOSALS SUBMITTED
BY DIFFERENT SCIENTIFIC FIELDS
COMPARED TO EXPECTED NUMBERS

Departmental Field	LOCI Proposals		Expectation Based on Science Faculty		Expectation Based on Scientists in Higher Education	
	N	%	N	%	N	%
Physical Sciences	408	32.2	210	16.6	217	17.1
Engineering	258	20.4	165	13.0	127	10.0
Mathematical Sciences	160	12.6	151	11.9	99	7.8
Computer Science	23	1.8	14	1.1	16	1.2
Environmental Sciences	45	3.5	49	3.9	51	4.0
Biological Sciences	180	14.2	242	19.1	372	29.4
Psychology	45	3.5	185	14.6	147	11.6
Social Sciences	148	11.7	251	19.8	238	18.8

TABLE 10

ACTUAL NUMBERS OF LOCI PROPOSALS SUBMITTED BY DIFFERENT SCIENTIFIC AREAS COMPARED TO EXPECTED NUMBERS

Departmental Area	LOCI Proposals		Expectation Based on Science Faculty		Expectation Based on Scientists in Higher Education	
	N	%	N	%	N	%
Pure vs. Applied						
Pure	986	77.8	1088	85.9	1124	88.8
Applied	281	22.2	179	14.1	143	11.2
Hard vs. Soft						
Hard	1074	84.8	831	65.6	882	69.6
Soft	193	15.2	436	34.4	385	30.4
Life vs. Nonlife						
Life	373	29.4	678	53.5	758	59.8
Nonlife	894	70.6	589	46.5	509	40.2

Chapter 4

LOCI Projects

In the two preceding chapters we drew conclusions about the total population of college science teachers and about those teachers who applied for LOCI awards. In chapter 2 we concluded that most college science teachers think that science courses need improvement. Faculty members at all types of institutions and in all scientific fields reported this sense of need and a sense of frustration over their lack of resources. In chapter 3 we concluded that those college science teachers who turned to LOCI for help constituted a special group. Many in the group taught at universities and private liberal arts colleges; relatively few taught at community colleges. There were many physicists, chemists, and computer scientists among LOCI applicants, and relatively few biologists, psychologists, and other social scientists.

This chapter focuses on an even more select group of college science teachers. The focus in this chapter is on the subset of applicants for LOCI awards who received funding. Who are they? Do they fully represent the applicant pool described in chapter 3? What sorts of projects do they undertake with LOCI funding? How large are the projects? How long in duration? What goals do project directors try to achieve in these projects? How do the project directors know when they achieve these goals?

Our specific objectives in this chapter are to describe:

a) the departmental and institutional affiliations of LOCI project directors;

b) the LOCI projects in size, duration, type of course involved, and content of the project;

c) the outcomes expected from these LOCI projects;

d) the methods that LOCI project directors intended to use to measure achievement of these outcomes.

Method

Sample

A total of 66 (or 40.5%) of the 163 proposals submitted in 1976 received LOCI funding; 129 (or 17.4%) of the 742 proposals submitted in 1977 received funding; and 135 (or 29.8%) of the 453 proposals submitted in 1978 received funding. We were able to obtain copies of 324 of the 330 proposals funded during this three-year period. These 324 proposals provided the data for the analyses reported in this chapter.

Procedure

Coders read the proposals and assigned ratings on variables in four major areas: source of proposal; nature of project; goals of project; and design of project evaluation. Reliability, assessed by calculating percent agreement in the ratings of two coders, was adequate for each of the four areas.

Source. The six variables describing source of the proposal were the same as those used in analyses reported in chapters 2 and 3. These variables were:

a) Institutional level and control--These two variables indicated whether the institution receiving the award was a university, or a four-year or two-year college and whether the institution was private or public (Pepin, 1978).

b) Racial background of the institution--We noted whether the institution was traditionally black or other (Turner and Michael, 1978).

c) Scientific area--Three variables indicated whether the proposal came from the "hard" vs. "soft," pure vs. applied, or life vs. nonlife sciences (Biglan, 1973).

Nature of the project. To describe project type, we first coded several characteristics from the face sheet of the proposal:

a) Funding--The three variables of interest were amount requested from NSF, institutional contribution to the project, and amount awarded by NSF.

b) Duration of the project--This variable was measured in months.

c) Class level--For this variable, proposals were coded as involving introductory courses, other courses, or programs.

d) Rank of project director--Project directors were classified as instructors, assistant professors, associate professors, or professors.

In addition, we devised a taxonomy based on the content of the instructional improvement projects. We developed the categories of the taxonomy after studying a number of published listings of instructional innovations and after sorting and resorting the 1976 LOCI proposals. Coders using the taxonomy first classified a project into one of two basic groups, depending on whether the primary intent of the proposer was to improve teaching methodology or to revise the

content of a course or a program. Coders then classified the project into a subcategory within the major category. For example, projects to revise teaching methodology could be classified as:

a) development of computer materials--simulations, games, interactive graphics programs, etc.;

b) design of individualized systems of instruction--Keller's Personalized System of Instruction, Postlethwait's audio-tutorial approach, and other self-paced, mastery-oriented approaches;

c) construction of audiovisual materials--videotapes, slide-tape supplements, etc.;

d) design of materials for inquiry learning;

e) revision of existing materials for disadvantaged students.

Proposals to revise content might focus on: individual courses, programs or sequences, or interdisciplinary efforts.

Expected outcomes. The categories used to describe project goals were based on two sources. First, we examined such sources as the taxonomy of higher education outcomes developed by the National Center for Higher Education Management Systems (Micek, Service, and Lee, 1975). The second source influencing the development of these categories was a reading of the 1976 proposals. This preliminary reading of proposals suggested that student, faculty, and other outcomes were expected from LOCI projects. Specifically, project directors anticipated outcomes such as these:

a) Student outcomes--Four variables indicated whether or not a project director expected an increase in student achievement, satisfaction, and enrollments, or a decrease in dropouts.

b) Faculty outcomes--Two additional variables indicated whether the project director expected an increase in faculty teaching skill and satisfaction.

c) Other--These two variables indicated whether the project director expected the project to result in increased community service and decreased instructional costs.

Evaluation features. In addition to noting whether each of these outcomes was expected, we noted whether the proposal described a method for evaluating achievement of the outcome. We also recorded whether the evaluation design included use of a control or comparison group.

Results

Changes in Projects over Time

We first looked for possible time trends in types of LOCI awards made in 1976, 1977, and 1978. Our intention was to determine whether there were any changes in source, type, goals, or evaluation of the proposals over the years. Dramatic changes would preclude analysis of a combined sample of proposals from the three years.

There were clearly differences in number and size of the proposals submitted and funded in the three competitions. The absolute number of proposals submitted increased sharply after the first year, and the percentage of proposals funded decreased. In addition, projects funded after 1976 were expected to be of somewhat longer duration, and they tended to be slightly more costly. We found no other differences, however, in proposals funded in different years. Projects from various years came from the same types of institutions,

from the same scientific fields, and from faculty members of similar rank. Projects were of similar types, had similar goals, and used the same types of designs to measure outcomes.

We concluded therefore that projects from the three years were similar enough to be included in a single analysis. Projects funded in the first year of the program were distinctive only in relatively small ways. Their deviation from the norm did not seem important enough to warrant special analyses for each of the three years.

Source of the Projects

Table 11 describes the institutional and departmental sources of both funded and unsuccessful proposals. The two sets of proposals came from similar sources, and percentage distributions for successful and unsuccessful proposals are therefore very similar. Proposals from all types of institutions and departments had roughly the same chance of success--about one in four. The review process was not biased in favor of any one type of institution or any one type of scientific field. The institutions and fields that submitted proposals were the ones that received LOCI funding.

Nature of the Projects

The average LOCI project was expected to take 16 months to complete. Although expected project duration ranged from 2 months to 60 months, few of the projects deviated so far from the average. Only 6% of the projects were expected to require 3 months or less to complete, and only 1% were expected to require more than 2 years for completion. Especially common were projects of 24 months in duration (nearly one-third of all projects) and projects of 12 months in duration (one-fifth of all projects).

To complete a project the average project director requested approximately $18,000 from NSF, but the amounts requested ranged from $1400 to $76,700. The average amount awarded by the Foundation was $16,000; the range of awards was from $2700 to $25,000. The amount requested from NSF was only a part of the total costs of these projects. The typical proposal reported an institutional contribution of nearly $11,000 to the project.

A total of 120 of the funded proposals (or 37.5% of the total) described the revision of courses at the introductory level; 156 projects (or 48.8% of the total) focused on courses beyond the introductory level; and the remaining projects focused on course sequences or programs. The projects were expected to affect a large number of students. The typical project director estimated that approximately 1280 students would be affected by his or her project within a period of five years. Estimates of numbers of students to be affected ranged from 25 to just over 25,000.

Project directors for the funded projects came from all academic ranks (Table 12). Compared to national norms, however, instructors and assistant professors were underrepresented in the ranks of LOCI project directors, and associate professors and full professors were overrepresented. Further analysis showed that senior faculty were overrepresented among LOCI award recipients at each level of institution--at universities, four-year colleges, and two-year colleges.

The LOCI program has been described as a program for young faculty members in the early stages of their careers. Since LOCI awards go to individual faculty members for work on their own courses,

teachers who receive awards do not need to have extensive support from their fellow faculty members. Nor do they need to have a history of funded projects behind them. Nonetheless, it is probably overly romantic to think of LOCI project directors as Young Turks. LOCI awards more often go to senior faculty members than to junior ones. LOCI money is less often used for a new beginning than for a diversion from a well-worn track.

The appeal of LOCI to senior faculty members distinguishes this program from other programs of support for instructional development. Michigan State University researchers (Davis, Abedor, and Witt, 1976) recently reported that applicants for educational development awards made by that institution were more often younger teachers. Kozma (1980) compared ranks of teachers who participated in four instructional improvement programs--Exxon Education Foundation's Impact program, NSF's LOCI program, the national workshop program of Georgetown University's Center for Personalized Instruction, and The University of Michigan's Instructional Development Fund program--and reported that the LOCI project directors were distinguished from the others by their higher academic ranks. LOCI's unique appeal to senior faculty members may be a strength of the program.

Nearly 60% of all LOCI projects were directed toward revising teaching methodology, and about 40% toward updating or adding new content (Table 13). About one-third of the methodology projects used the computer to individualize teaching, and many other projects sought to individualize instruction without the computer; e.g., with Keller's Personalized System of Instruction or Postlethwait's audiotutorial approach. Another large group of projects sought to improve teaching

by use of inquiry learning; e.g., case materials, Wales' guided design approach, or open-ended laboratory investigations. Over two-thirds of the content-oriented projects focused on a single course. The other content-oriented projects were directed toward a sequence of courses or were interdisciplinary projects.

Project Goals

Project directors expected a variety of outcomes from their projects (Table 14). Over three-quarters expected an increase in student knowledge and nearly three-quarters expected an increase in student satisfaction in courses revised with LOCI funding. Other outcomes mentioned by project directors were increased faculty satisfaction in teaching, greater cost effectiveness, and increased enrollment. Many of the project directors anticipated achieving success on more than one of these goals.

Evaluation Design

The evaluation designs proposed for measuring these outcomes were not very rigorous (Table 14). One-third of those who expected an increase in student achievement, for example, did not propose to measure student achievement in the course revised with LOCI funding. Another third proposed to measure student achievement in the course revised with LOCI funding but did not plan to collect achievement data from a control or comparison group. Only one-third of those interested in student achievement intended to use both a treatment and control group in their evaluations.

For other outcomes, lack of rigor in evaluation was equally notable. A total of 225 of the 324 project directors (or 69.4%), for example, expected student satisfaction to increase in their revised

courses. Although most of these 225 project directors intended to measure student satisfaction in a revised course, only 42 or the 225 intended to compare the responses of the students in the revised course with responses of control students in a previously or concurrently offered course.

The lack of adequate evaluation plans for LOCI projects was one of the key impressions that the 324 proposals made on us. Some of the proposals seemed preoccupied with the means that would be used in a project--configurations of hardware and layouts of space--and seemed almost to ignore the ends to be achieved by such means. But even those project directors who were explicit about their objectives were often vague about how they would demonstrate their achievement of these objectives. Only a few proposals among the 324 that we read contained names of tests and instruments that would be used to demonstrate effects. And at most only one or two proposals contained data on the current level of achievement or student satisfaction in the course that might be refined with LOCI funding.

Summary and Conclusions

Analyses reported in this chapter showed that review of LOCI proposals by NSF review panels was evenhanded. Proposals from all types of institutions and scientific fields had about the same chance of success--about one in five. Institutions and fields that submitted many proposals received many LOCI awards; institutions and fields that submitted few proposals received few awards.

The statistically average project supported by a LOCI award required about $16,000 of NSF funds, about $11,000 of local funding, and about 16 months for completion. The project was about as likely

to involve an introductory course as it was to involve an upper division science course. The typical project was expected to affect approximately 1300 students during a five-year period.

LOCI project directors came from all academic ranks; they included instructors, assistant professors, associate professors, and full professors. But compared to national norms, professors were somewhat overrepresented and instructors and assistant professors somewhat underrepresented among recipients of awards. Programs like LOCI that offer support for instructional improvement--both those mounted by individual institutions and those developed for national audiences--have often been reported to be more attractive to junior faculty than to senior faculty. The appeal of LOCI to senior faculty members distinguishes it from other programs and may be a unique strength of this funding program.

Nearly 60% of all LOCI projects were directed toward revising teaching methodology, and about 40% toward updating or adding new content. About one-third of the methodology projects were computer-based; many of the other methodology projects involved individualized instruction or inquiry learning. The outcomes most often expected from LOCI projects were increased student knowledge (expected of more than 3/4 of all projects) and increased student satisfaction (expected by nearly 3/4 of the projects). Other outcomes mentioned by project directors in their proposals were increased faculty satisfaction in teaching, greater cost effectiveness, and increased enrollments.

One of the most striking impressions left from our reading of 324 funded proposals was of the weakness in designs used to evaluate project outcomes. One-third of those who expected an increase in

student achievement, for example, did not propose any formal measurement of student achievement in the course revised with LOCI funding. Another third proposed to measure student achievement in a revised course but did not plan to collect achievement data from a control course of any sort. Only one-third of those interested in student achievement intended to use both a treatment and control group in evaluating project outcomes.

The statistical portrait of LOCI projects presented in this chapter holds equally well for projects funded in 1976, 1977, and 1978. Projects for three years came from the same types of institutions, from the same scientific fields, and from faculty members of similar rank. Projects funded during the three different years were of similar types, had similar goals, and employed the same types of designs for measurement of outcomes.

TABLE 11

CHARACTERISTICS OF INSTITUTIONS AND DEPARTMENTS SUBMITTING SUCCESSFUL AND UNSUCCESSFUL LOCI PROPOSALS

Characteristic	Successful Proposals		Unsuccessful Proposals		Chi-Square	Sig.
	N	%	N	%		
Control of Institution						
Public	199	60.3	655	63.7	1.25	ns
Private	131	39.7	373	36.3		
Level of Institution						
University	128	38.8	383	37.3	0.61	ns
Four-Year	173	52.4	563	54.8		
Two-Year	29	8.8	82	8.0		
Racial Tradition						
Traditionally Black	8	2.4	27	2.6	0.04	ns
Other	322	97.6	1001	97.4		
Pure vs. Applied Sciences						
Pure	252	76.4	734	78.3	0.55	ns
Applied	78	23.6	203	21.7		
Hard vs. Soft Sciences						
Hard	282	85.5	792	84.5	0.16	ns
Soft	48	14.5	145	15.5		
Life vs. Nonlife Sciences						
Life	92	27.9	281	30.0	0.52	ns
Nonlife	238	72.1	656	70.0		

TABLE 12

ACTUAL NUMBERS OF LOCI PROJECT DIRECTORS AT FOUR ACADEMIC RANKS COMPARED TO EXPECTED NUMBERS

Academic Rank	Project Directors		Expectation Based on Population		Chi-Square	Sig.
	N	%	N	%		
Instructor	9	2.9	35	11.3	22.02	.001
Assistant Professor	92	29.7	101	32.5		
Associate Professor	87	28.1	88	28.4		
Professor	122	39.4	86	27.8		

TABLE 13

CLASSIFICATION OF 324 LOCI PROJECTS
BY CONTENT OF PROJECT

Type Of Project	N	%
Revision of Teaching Method		
Computer-based	65	20.1
Individualized instruction	45	13.8
Inquiry learning	51	15.7
Audiovisual materials	22	6.8
Materials for disadvantaged	9	2.8
Revision of Content		
New or updated course	74	22.8
New or updated programs	38	11.7
New interdisciplinary course	20	6.2

TABLE 14

EXPECTED OUTCOMES AND METHODS OF MEASURING IN 324 LOCI PROJECTS

Possible Outcome	Proposed as Project Outcome		Proposed and to be Measured		Proposed and to be Measured with Control	
	N	%	N	%	N	%
Student Outcomes						
Knowledge	264	81.5	176	54.3	94	29.0
Satisfaction	225	69.4	188	58.0	42	13.0
Enrollment	69	21.3	41	12.7	11	3.4
Retention	19	5.9	13	4.0	8	2.5
Faculty Outcomes						
Teaching skill	22	6.8	5	1.5	0	0.0
Satisfaction	78	24.1	56	17.2	5	1.5
Other Outcomes						
Community	37	11.4	5	1.5	0	0.0
Economic	73	22.5	25	7.7	2	0.6

Chapter 5

Outcomes Reported by LOCI Project Directors

What were the outcomes of the LOCI projects? Did the faculty members who carried out these projects consider them successful? Did the projects contribute as much as expected to student learning and satisfaction? Did they contribute to the development of the project directors as science teachers? Did they have "ripple" effects on other faculty members at project directors' institutions or other institutions?

This chapter and the chapter to follow provide answers to these questions. In this chapter we present results from a questionnaire on LOCI outcomes mailed to project directors and to chairpersons or deans of the project directors' institutions. In the chapter to follow, we supplement results from this survey with an examination of the outcomes that project directors documented in their final project reports.

Method

Questionnaire

We developed two forms of a questionnaire for evaluation of outcomes of LOCI projects. One of the forms was designed to be filled out by project directors; the other by department chairpersons at the institutions receiving LOCI awards (Appendix B). Instructions and wording on the two forms of the questionnaire differed slightly, but in substance the two forms were identical.

Each of the forms had four major parts. The first consisted of four items asking for an overall evaluation of the success of the project. The second part had eight items on instructional outcomes of the project. The third part of the questionnaire contained four items, and covered effect of the project on the faculty member. Finally, the two items in the fourth part of the questionnaire asked for a description of the current status of the project.

The items used in the questionnaire were similar to items used by others in evaluating instructional and faculty development programs:

a) The four items on overall evaluation were also used in the evaluation of Michigan State's Educational Development Program (Davis, Abedor, and Witt, 1976). This program makes about 35 awards a year to Michigan State faculty for instructional improvement projects. The dollar amount of awards at Michigan State has varied over the years, but a typical award averaged $10,000 in 1965 and about $2750 in 1975.

b) Items on instructional outcomes, faculty development, and current status of the project were similar to those used in evaluating the California State University and Colleges' Program for Innovation and Improvement in the Instructional Process (California State University and Colleges, 1977). During the first six years of its existence, this program made about 150 awards per year to California State teachers for instructional improvement projects. Funding for this program was recently augmented, and the maximum amount of awards was raised to $5000 in 1977-78.

c) Many of the items on our questionnaire were also used in a telephone survey of individuals participating in the Exxon Education Foundation's Impact Program, The University of Michigan's Instructional Development Fund program, and the national workshop program of Georgetown University's Center for Personalized Instruction (Kozma, 1980).

Our decision to use items previously used by others was deliberate. The use of these common items allowed us to compare reported LOCI outcomes with reported outcomes for other faculty and instructional development programs.

Sample

In April of 1979 we mailed two questionnaires--one for project director and one for department chairperson or dean--to each of the 66 project directors who had received LOCI awards in 1976. All of these project directors were scheduled to complete their projects before January of 1979. Two weeks after the initial mailing, we sent second copies of the questionnaires to nonrespondents. By July 1979 we had received completed questionnaires from 55 of the project directors and from 32 departmental chairpersons.

We made no further effort to reach department chairpersons or deans who had not returned questionnaires. In the fall of 1979, however, we telephoned the 11 directors who had not returned questionnaires to check on their addresses and to ask once again for cooperation in our study. After contacting the project directors by phone and securing their cooperation, we mailed additional copies o

the questionnaires to them in November 1979. We received completed questionnaires from four of the LOCI project directors for a total return rate of 59 out of 66 (or 89.4%).

Characteristics of Projects

A number of characteristics of project directors coded for previous analyses were available for this analysis. These included:

a) Institutional characteristics--Institutions were classified according to level and control (Pepin, 1978).

b) Scientific areas--Project directors were classified as being in the pure or applied sciences, "hard" or "soft" sciences, and life or nonlife sciences (Biglan, 1973).

c) Individual characteristics of project directors--The three characteristics coded were academic rank, chairperson status, and administrator status.

Respondents vs. Nonrespondents

With the small number of nonrespondents to the outcome questionnaire, we knew that it would be difficult to find any statistically significant differences between respondents and nonrespondents, but nonetheless we considered it important to compare the two groups to determine whether project directors who returned questionnaires differed substantially from those who did not return questionnaires. It turned out that respondents and nonrespondents were very similar in major characteristics (Table 15). We could see no reason for believing that individuals returning questionnaires differed in institutional, departmental, or individual characteristics from individuals who did not return questionnaires.

Results

Overall Description of Outcomes

In this section we present results on the four major sections of the questionnaire for the total group of respondents.

Overall evaluation. Most project directors reported that their projects were successful (Table 16). Approximately 93% of the project directors said that their projects were probably or definitely a success; approximately 95% said that the projects were worth the effort; approximately 86% said that they would consider doing another project; and approximately 71% reported that their colleagues considered their projects successful. The responses of these LOCI project directors were very similar to those made by the directors of educational development projects supported by Michigan State University (Davis, Abedor, and Witt, 1976). Approximately 93% of Michigan State project directors considered their projects probably or definitely a success; 95% considered their projects worth the effort; 94% would consider another educational development project; and about 79% reported that their colleagues considered these projects a success.

The second part of Table 16 shows that responses of chairpersons were very similar to those of project directors. Approximately 93% of project directors, for ex considered theif projects a success; and approximately 97% of department chairpersons considered these projects successful. Approximately 95% of project directors and 97% of chairpersons rated the projects as probably or definitely worth the effort. Similarity in response of project directors and departmental chairpersons was not restricted to this part of the questionnaire. It

was notable in results on every item that we asked. Similarity in response of project directors and chairpersons is one of the salient features of the tables which follows in this report.

Instructional effectiveness. The typical project reportedly affected 150 students each year, and most project directors reported that the effects on students were very positive (Table 17). Benefits on learning and course enjoyment were reported to be especially clear. Approximately 88% of all project directors reported at least a slight increase in the number of students learning course material, and 98% reported some increase in student satisfaction. The increase in service to the community was only slightly less dramatic; about 67% of project directors reported an increase in community service attributable to their projects. LOCI projects apparently made smaller contributions to course enrollments, dropout rates, and instructional costs. Less than half the project directors reported increases in enrollments or decreases in dropouts due to LOCI projects, and about a third of the projects reportedly reduced instructional costs.

Our items on student learning and enjoyment were similar to items used by researchers at the California State University and Colleges in their evaluation of the Program for Innovation and Improvement in the Instructional Process (California State University and Colleges, 1977). About 96% of California State award recipients reported that the number of students learning course material increased at least slightly, and all of the award recipients in the California State competition reported that students enjoyed the revised courses more than they had the original courses. These results are, of course, very similar to results reported by LOCI project directors.

Faculty development. Most project directors reported that their projects had a favorable impact on their professional development (Table 18). A total of 77% said that their general effectiveness as teachers improved; 82% reported an increase in professional satisfaction; 65% reported increased involvement in teaching improvement; 56% reported more contact with other faculty about teaching improvement. Responses of LOCI project directors to these faculty development items were very similar to the responses made by California State award recipients to a similar set of items. A total of 79% of the California State award recipients reported increased effectiveness as teachers; 91% reported increased professional satisfaction; 67% reported greater involvement in teaching improvement on campus; and 50% reported more contacts on teaching improvement.

Current status of the project. A total of 58 project directors responded to our question about the present state of results of their LOCI projects. Of these, 15 (or 26%) reported that their projects would be continued in an expanded form; 26 (or 45%) reported that their projects would be continued in the original form; 13 (or 22%) reported that their projects would be continued with reduced scope; and 4 (or 7%) reported that their projects would be or were cancelled. Researchers at the California State University and Colleges used a similar item in their evaluation of the system's instructional improvement program. California State project directors reported a somewhat less favorable fate for their projects than LOCI project directors did. In the California State system, 32% of project directors reported continuation of their projects in an expanded form;

18% reported continuation in the original form; 43% reported a reduction in project scope; and 4% reported cancellation of their projects.

Of the 58 project directors who responded to our question on use of their LOCI projects by others, 33 (or 57%) reported use by other instructors in their own departments, 12 (or 21%) reported use by instructors in other departments; and 20 (or 34%) reported use at other institutions. A comparable item was used in the California State evaluation of its instructional improvement program. Project directors in the California State system reported slightly less use of their results locally, but the same amount of dissemination of results to other departments and institutions. In the California State system, 31% of project directors reported use by other teachers in their departments, 21% reported use in other departments, and 29% reported use at other institutions.

Differences among Institutions, Fields, and Individuals

In this part of the analysis, we tried to determine whether LOCI projects had different outcomes at different types of institutions, in different fields, and for individuals in different positions.

Overall evaluation. The four items on overall evaluation of project outcomes correlated highly with each other. Using the results of a factor analysis of the four items, we decided to calculate total scores to reflect overall evaluation of outcomes. The alpha-reliability of this 4-item scale was .78. We used stepwise multiple regression to explore the relationship between scores on this scale and institutional and departmental characteristics of respondents. No

institutional, departmental, or individual characteristic was significantly related to overall evaluation of success of LOCI projects.

Instructional effectiveness. We first determined that total number of students affected by LOCI projects was unrelated to any institutional, departmental, or individual characteristics. We then used factor analysis to explore the dimensionality of the eight items on instructional effectiveness. We again found one common factor in the eight items, and formed a scale to measure overall instructional effectiveness by summing scores on six of the eight items. Two items were excluded from the scale because of low communalities and low loadings on this common factor. These two items were: students learned something different and instructional costs decreased. The alpha-reliability for this scale was .68. In a final analysis, we found that departmental, institutional, and individual characteristics were not related to scores on the instructional effectiveness scale.

Faculty development. Again using factor analysis as a basis, we formed an overall scale of impact on faculty development by summing scores on the four relevant items. The alpha-reliability for this scale was .71. We found that faculty development outcomes were not related to institutional, departmental, or individual characteristics.

Current status of the project. Our questionnaire measured current status of LOCI projects in two items. These items asked whether the project was being continued in some form or was discontinued, and whether the product of the LOCI project was being

used by others. We found no relation between institutional, departmental, and individual characteristics and the current status of the project as measured by the two items.

Summary and Conclusions

In April of 1979 we sent questionnaires to 66 LOCI project directors scheduled to finish their LOCI projects by the end of 1978. A total of 59 of these 66 project directors returned questionnaires to us. These 59 respondents represented the total sample surveyed in terms of individual characteristics and institutional and departmental affiliations.

Most project directors considered their projects to be clear successes. They also reported clear benefits for students on most of the teaching effectiveness items. In addition, most project directors also reported that LOCI projects contributed to their professional development. When asked about the current status of their projects, a majority of project directors (71%) reported that their projects would be continued either in original or expanded form. Many also reported that the products of their LOCI work were being used by others either within or outside their institutions.

Using factor analysis as a guide, we constructed three scales to measure project directors' overall evaluation of projects, contribution of the project to instructional outcomes, and contribution to faculty development. The alpha-reliabilities for these three scales were .87, .68, and .71. We were not able to find any relationship between scores on these scales and characteristics of LOCI project directors or characteristics of the institutions and

departments in which LOCI projects were carried out. Nor were we able to find a relationship between institutional, departmental, or individual characteristics and the current status of LOCI projects.

TABLE 15

CHARACTERISTICS OF RESPONDENTS AND NONRESPONDENTS TO THE OUTCOME QUESTIONNAIRE

Characteristic	Respondents		Non-respondents	
	N	%	N	%
Control of Institution				
Public	33	55.9	5	71.4
Private	26	44.1	2	28.6
Level of Institution				
University	23	39.0	3	42.8
Four-Year	31	52.5	4	57.2
Two-Year	5	8.5	0	0.0
Pure vs. Applied Sciences				
Pure	45	76.3	5	71.4
Applied	14	23.7	2	28.6
Hard vs. Soft Sciences				
Hard	51	86.4	6	85.7
Soft	8	13.6	1	14.3
Life vs. Nonlife Sciences				
Life	16	27.1	1	14.3
Nonlife	43	72.9	6	85.7
Academic Ranks				
Assistant Professor	17	28.8	2	33.3
Associate Professor	13	22.0	2	33.3
Full Professor	29	49.2	2	33.3

TABLE 16

OVERALL EVALUATION OF LOCI OUTCOMES BY 59 PROJECT DIRECTORS AND 32 DEPARTMENT CHAIRPERSONS

Item	Definitely Not (1)		Probably Not (2)		Uncertain (3)		Probably Yes (4)		Definitely Yes (5)		Mean
	N	%	N	%	N	%	N	%	N	%	
PROJECT DIRECTORS											
Project a Success	0	0.0	0	0.0	4	6.9	19	32.9	35	60.3	4.53
Worth the Effort	0	0.0	0	0.0	3	5.2	11	19.0	44	75.9	4.71
Would Consider Another	1	1.7	0	0.0	7	12.1	14	24.1	36	62.1	4.45
Others Call it a Success	0	0.0	3	5.2	14	24.1	25	43.1	16	27.6	3.93
DEPARTMENT CHAIRPERSONS											
Project a Success	0	0.0	0	0.0	1	3.1	14	43.8	17	53.1	4.50
Worth the Effort	0	0.0	1	3.1	0	0.0	9	28.1	22	68.8	4.62
Would Consider Another	0	0.0	0	0.0	2	6.3	5	15.6	25	78.1	4.72
Others Call it a Success	0	0.0	0	0.0	5	15.6	13	40.6	14	43.8	4.28

TABLE 17

EVALUATION OF INSTRUCTIONAL EFFECTIVENESS BY 59 PROJECT DIRECTORS AND 32 DEPARTMENT CHAIRPERSONS

Item	Not at All (1)		Slightly (2)		Considerably (3)		To a Great Extent (4)		Mean
	N	%	N	%	N	%	N	%	
PROJECT DIRECTORS									
More Learning	6	12.2	15	30.6	14	28.6	14	[illegible]	2.73
More Retention	4	8.7	19	41.3	19	41.3	4	8.7	2.50
More Enjoyment	1	2.0	8	16.0	25	50.0	16	32.0	3.12
Different Learning	2	3.8	7	13.5	10	19.2	33	63.5	3.42
Increased Enrollment	26	57.8	11	24.4	6	13.3	2	4.4	1.64
Decreased Dropouts	25	56.8	13	29.5	6	13.6	0	0.0	1.57
More Community Service	17	32.7	22	42.3	9	17.3	4	7.7	2.00
Costs Decreased	33	63.5	12	23.1	5	9.6	2	3.8	1.54
DEPARTMENT CHAIRPERSONS									
More Learning	3	11.1	9	33.3	9	33.3	6	22.6	2.67
More Retention	1	3.6	9	32.1	14	50.0	4	14.3	2.75
More Enjoyment	2	6.7	2	6.7	16	53.3	10	33.3	3.13
Different Learning	2	6.5	3	9.7	8	25.8	18	58.1	3.35
Increased Enrollment	13	48.1	7	25.9	4	14.8	3	11.1	1.89
Decreased Dropouts	13	46.4	13	46.4	1	3.6	1	3.6	1.64
More Community Service	7	24.1	10	34.5	9	31.0	3	10.3	2.28
Costs Decreased	21	70.0	4	13.3	3	10.0	2	6.7	1.53

TABLE 18

EVALUATION OF FACULTY DEVELOPMENT BY 59 PROJECT DIRECTORS AND 32 DEPARTMENT CHAIRPERSONS

Item	Decreased a Great Deal (1)		Decreased a Moderate Amount (2)		Stayed about the Same (3)		Increased a Moderate Amount (4)		Increased a Great Deal (5)		Mean
	N	%	N	%	N	%	N	%	N	%	
PROJECT DIRECTORS											
Effectiveness	0	0.0	0	0.0	13	22.8	33	57.9	11	19.3	3.96
Satisfaction	0	0.0	2	3.5	8	14.0	28	49.1	19	33.3	4.12
Involvement	0	0.0	1	1.8	19	33.3	24	42.1	13	22.8	3.86
Contacts	0	0.0	0	0.0	24	43.6	24	43.6	7	12.7	3.69
DEPARTMENT CHAIRPERSONS											
Effectiveness	0	0.0	0	0.0	7	22.6	17	54.8	7	22.6	4.00
Involvement	0	0.0	0	0.0	13	40.6	8	25.0	11	34.4	3.94

Chapter 6

Final Reports

In the preceding chapter we saw that LOCI project directors reported favorable outcomes from their projects. A majority of project directors reported increased student learning, greater student satisfaction, and more community service as a result of their projects. Many reported increased enrollment and reduced instructional costs as additional benefits from their work. The typical project director estimated that approximately 160 students per year were affected by his or her LOCI project.

To what extent were project directors able to document these effects? This is the basic question addressed in this chapter. To answer it, we examined the final reports prepared by project directors for NSF. This chapter covers the characteristics of projects for which final reports were available, the types of final reports submitted, and the findings included in the reports.

Method

Sample

The 66 individuals who received LOCI funding in 1976 were expected to submit final reports to NSF by December 1978--within 30 months of receipt of their awards. Reports for projects funded after 1976 were not due at the Foundation until after December 1979--too late for inclusion in our analyses. The 66 proposals funded in 1976 thus became the population of interest in this chapter. For reasons unrelated to the goals of this project, however, we were able to obtain copies of proposals for only 64 of these 66 projects. Because

of the necessity of using both proposals and reports in our analyses, we restricted our interest to the 64 projects for which proposals were available.

In April 1979 we sent each of the 64 project directors a request to forward to us any reports available on a LOCI project. In addition, in August 1979, we obtained copies of all final reports submitted to NSF by LOCI project directors who had received funding in 1976. In all, documents obtained from these two sources described outcomes of 44 (or 69%) of the 64 projects.

Variables

Most of the variables used in analyses reported in this chapter are familiar from previous chapters:

a) Institutional characteristics--We classified institutions once again according to level and control (Pepin, 1978).

b) Scientific area--We noted whether project directors were in the pure or applied, "hard" or "soft," and life or nonlife sciences (Biglan, 1973).

d) Academic rank of project director--We noted academic rank at time of submission of the proposal for LOCI funding.

e) Nature of the project, expected outcomes, and type of evaluation--We used the taxonomies described in chapter 4 to classify projects in these respects.

We also classified each experimental result reported in the final reports according to the size of effect. We used a five-point scale going from strong positive to strong negative. Strong effects were those which were statistically significant and large enough to be easily noticed. We classified as strong effects, for example, final

examination differences of 8 or 9 percentage points, differences in laboratory costs of several thousand dollars, and student rating differences of one-half point on a five-point scale. Strength of effect could be determined only for projects that provided quantitative results from both experimental and control groups (either concurrent or historical control groups). It was impossible to code for strength of effect when data were impressionistic or baseline data were unavailable.

Reliability of Coding

Two project staff members independently coded each result described in each report for strength of effect. Their average agreement on strength of effect was 87%. Initial differences between raters were discussed until they reached agreement about the coding of each report on each outcome.

Results

Projects With and Without Final Reports

In most respects project directors who submitted final reports and those who did not submit reports were indistinguishable (Table 19). Final reports were equally likely to be submitted by public and private institutions; by universities, four-year, and two-year colleges; and by teachers at various academic ranks. Scientific area, however, was related to likelihood of submitting a final report. Teachers in the "hard" sciences were more likely to complete final reports than teachers in the "soft" sciences. Of the 10 psychologists and social scientists who received 1976 LOCI awards, 6 (or 60%) did not submit final reports by August 1979. Of 54 faculty members in the "hard" sciences, only 14 (or 26%) did not submit final reports.

By this point in our analyses, we were used to getting heartier responses from natural scientists and weaker ones from psychologists and social scientists. We observed the same pattern in applications for LOCI awards and in responses to our needs questionnaire. We know of no data to suggest that psychologists and social scientists are generally less responsive or less cooperative than other scientists. But psychologists and social scientists may feel less identified with NSF's programs and studies. This is at least one possibility to be considered in trying to make sense of the perplexing differences that we found among scientific areas.

Types of projects on which final reports were available were similar to types of projects on which reports were unavailable (Table 20). It would be impossible, therefore, to predict whether or not a final report would be submitted based on knowledge of the type of project undertaken. Nor could we find any evidence that projects lacking final reports had distinctive goals or evaluation plans that set them apart from other projects.

Types of Final Reports

The 44 final reports submitted by project directors fell into several groups:

a) Project summary only--Nine (or 20%) of the project directors submitted only a one-page summary of project results.

b) Brief technical report--A total of 13 (or 30%) of the reports included a technical report of from one to five pages.

c) Other technical report--A total of 22 (or 50%) of the 44 reports included a technical report of more than 6 pages.

Some of the final reports also contained appended material, including course outlines, study guides, problem sets, laboratory exercises, etc.

The diversity of technical reports may have been partly a result of uncertainty about the expectations of NSF. One project director, who submitted a two-sentence "technical description of project and results," added the note:

> Please inform me of the type of technical summary of activities and results which are desired by the Foundation. (From a project director at a public university.)

Another project director cited a dissertation that contained extensive data on his project. Along with the citation, he wrote:

> We have not sent a copy of this to NSF; I have been assuming that you do not want a dissertation. If you do, we will be happy to send a copy. (From a project director at a public university.)

Measurement and Size of Project Effects

Projects also fell into several types when classified according to their method of determining outcomes. Among the 44 final reports were:

a) Impressionistic reports on project outcomes--These contained no quantitative results from the course redesigned with LOCI funding and contained no results from comparison groups. A total of 24 (or 55%) of the reports were of this type.

b) Quantitative reports without control data--Eight (or 18%) of the final reports were of this sort. Outcomes were measured in the course designed or redesigned with LOCI funding, but no control or comparison data were collected or cited.

c) Controlled comparisons of outcomes--A total of 12 (or 27%) of the final reports contained results from measurements made in both the redesigned course and a control or comparison course.

Table 21 provides more data on measurement of course outcomes. Column 1 gives the number and percentage of the 44 projects that were designed to influence each outcome. The data in column 1 came from the proposals describing the 44 projects. Column 2 gives the number of project directors proposing quantitative measurement of each outcome, and column 3 gives the number actually describing measurement of each outcome in the final reports. Finally, columns 4 and 5 give the number of projects proposing to measure and actually measuring each outcome with a control or comparison group.

The general trend in the table should be clear. Project directors expressed fairly ambitious goals for their projects in their proposals, but not all committed themselves to collecting quantitative data on goal achievement, and even fewer proposed collection of quantitative data on comparison groups. In their final reports, however, project directors measured less than their proposals suggested they would. Whereas 50% proposed to measure achievement outcomes, for example, only 16% indicated in final reports that they collected data to measure final student achievement in the redesigned course.

A relatively small proportion of the project reports provided evidence of strong effects on outcome measures (Table 22). Projects producing strong effects were the following:

a) A project to develop desktop laboratory kits and to investigate the effects of these laboratory kits on student reasoning produced strong effects. Another project to develop a small-group, inquiry-oriented approach to laboratory science was also able to demonstrate substantial effects of the teaching method on level of cognitive functioning. Both of these projects are described in detail in the third volume of this report.

b) A negative effect on student achievement was reported from a project investigating hand-held calculators as a substitute for computers. The project director reported less learning of Fortran by students using the calculators.

c) Three of the four strong effects on student satisfaction were reported in courses given by Keller's personalized system of instruction. The fourth project reporting a strong effect on student satisfaction used semi-paced instruction, a variation of the Keller plan for teaching.

d) A strong effect on the dropout rate was also reported in the project using semi-paced instruction. Students in the semi-paced group were more likely to complete the course (less likely to drop out) than students taught by conventional means.

e) Two studies reported reduced instructional costs. One study demonstrated that the cost of organic chemistry experiments could be cut by recycling solvents used in the experiments. The other developed computer programs that simulated

"debugging" ordinarily done by an "exclusive use" computer. The project director estimated a reduction of computing costs in his computer science class of $14,000 per term.

Did the final reports provide evidence of other important outcomes? To answer this question, we reviewed comments in the reports. Table 23 describes these additional outcomes of LOCI projects. The additional outcomes included journal articles, chapters of books, and other publications; presentations at national conferences and meetings; grants for other instructional improvement projects; and awards for contributions to instruction.

Summary and Conclusions

In their responses to our questionnaire, LOCI project directors reported numerous positive results from their projects. The purpose of this chapter was to determine the extent to which these positive outcomes were documented in project directors' final reports to NSF. The data for the analyses in this chapter came from 44 final reports submitted by LOCI project directors who received funding in 1976.

Our general impression is that LOCI project directors do not adequately document the results of their projects:

a) Only 70% of project directors had submitted final reports of any kind to NSF within a year after these reports were due. Psychologists and social scientists seemed to be especially remiss in submitting reports on their work.

b) Many of the final reports that were available were brief and impressionistic. One-fifth of the available reports consisted of no more than a one-page summary of project results; one-half of the reports contained fewer than five pages. Most of

the available reports were also largely impressionistic. Over half lacked any description of measured course outcomes; only a quarter described results from both an experimental class and a control or comparison class of any kind.

Only a small number of final reports contained results that suggested strong positive effects from course redesign. Less than 5% of the reports contained evidence of strong positive effects on student achievement; less than 10% contained evidence of strong positive effects on student satisfaction. The only generalization that seemed to be supported by evidence in several reports was that students reacted more favorably to courses redesigned to incorporate major features of Keller's personalized system of instruction than they did to conventional courses.

The failure of LOCI project directors to document their accomplishments more fully is a potentially serious one for the program. It keeps program managers from synthesizing the results of LOCI projects effectively. In recent years educational researchers have developed tools for objectively synthesizing applied findings in education and other areas, and these tools can yield objective generalizations about the overall effectiveness of large groups of projects and about the differential effectiveness of projects of different types, in different settings, and so on. In principle, these tools can be applied to results from funding programs such as LOCI, but in reality the results reported by LOCI project directors are far too impressionistic to be of use in objective synthesis. This seems to us a shame and a shortcoming of the program.

TABLE 19

CHARACTERISTICS OF 44 LOCI PROJECT DIRECTORS SUBMITTING AND 20 NOT SUBMITTING FINAL REPORTS

Characteristic	Submitting Report		Not Submitting Report		Chi-Square	Sig.
	N	%	N	%		
Control of Institution						
Public	29	65.9	10	50.0	1.46	ns
Private	15	34.1	10	50.0		
Level of Institution						
University	19	43.2	6	30.0	1.66	ns
Four-Year	22	50.0	11	55.0		
Two-Year	3	6.8	3	15.0		
Pure vs. Applied Sciences						
Pure	32	72.7	16	80.0	0.39	ns
Applied	12	27.3	4	20.0		
Hard vs. Soft Sciences						
Hard	40	90.9	14	70.0	4.56	.050
Soft	4	9.1	6	30.0		
Life vs. Nonlife Sciences						
Life	10	22.7	8	40.0	2.03	ns
Nonlife	34	77.3	12	60.0		
Academic Rank						
Instructor/Assistant Professor	14	31.8	5	25.0	0.77	ns
Associate Professor	11	25.0	4	20.0		
Professor	19	43.2	11	55.0		

TABLE 20

TYPES OF PROJECTS CONDUCTED BY 44 LOCI PROJECTORS SUBMITTING AND 20 NOT SUBMITTING FINAL REPORTS

Type of Project	Submitting Report		Not Submitting Report	
	N	%	N	%
Revision of Teaching Method				
Computer-based	10	22.7	4	20.0
Individualized instruction	10	22.7	3	15.0
Inquiry learning	8	18.2	2	10.0
Audiovisual materials	4	9.1	3	15.0
Materials for disadvantaged	0	0.0	1	5.0
Revision of Content				
New or updated course	6	13.6	3	15.0
New or updated programs	4	9.1	2	10.0
New interdisciplinary course	2	4.5	2	10.0

TABLE 21

PROPOSED OUTCOMES AND METHOD OF MEASURING OUTCOMES IN 44 PROPOSALS AND 44 FINAL REPORTS

Possible Outcome	Proposed as Project Outcome		Measurement of Objective				Measurement with Control			
			Proposed		Reported		Proposed		Reported	
	N	%	N	%	N	%	N	%	N	%
Student Outcomes										
Knowledge	26	59.1	22	50.0	7	15.9	8	18.2	7	15.9
Satisfaction	26	59.1	26	59.1	10	22.7	7	15.9	5	11.4
Enrollment	5	11.4	4	9.1	3	6.8	1	2.3	1	2.3
Retention	1	2.3	1	2.3	5	11.4	1	2.3	3	6.8
Faculty Outcomes										
Teaching skill	1	2.3	1	2.3	0	0.0	0	0.0	0	0.0
Satisfaction	12	27.3	12	27.3	1	2.3	2	4.5	0	0.0
Other Outcomes										
Community	5	11.4	1	11.4	1	2.3	0	0.0	0	0.0
Economic	17	38.6	3	38.6	5	11.4	0	0.0	2	4.5

TABLE 22

STRENGTH OF EFFECTS DESCRIBED IN 44 LOCI FINAL REPORTS

Outcome	Strength of Effect									
	Strong Positive		Weak Positive		No Difference		Weak Negative		Strong Negative	
	N	%	N	%	N	%	N	%	N	%
Student Outcomes										
Knowledge	2	4.5	0	0.0	4	9.1	0	0.0	1	2.3
Satisfaction	4	9.1	0	0.0	1	2.3	0	0.0	0	0.0
Enrollment	0	0.0	1	2.3	0	0.0	0	0.0	0	0.0
Retention	1	2.3	1	2.3	1	2.3	0	0.0	0	0.0
Faculty Outcomes										
Teaching skill	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Satisfaction	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other Outcomes										
Community	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Economic	2	4.5	0	0.0	0	0.0	0	0.0	0	0.0

TABLE 23

ADDITIONAL OUTCOMES LISTED IN 44 FINAL REPORTS

Outcome	Number of Reports	% of All Reports
Published articles, chapters, etc.	12	27.3
Thesis, unpublished papers	5	11.4
Presentations at national conferences	8	18.2
Presentations at state and local meetings	7	15.9
CAUSE, ISEP grants, etc.	3	6.8
Teaching awards	1	2.3

Chapter 7

Overall Summary and Conclusions

This evaluation was designed to answer questions in four major areas. As listed in the introduction to the report, these areas were: the need for support for local course improvement; response to the LOCI program; outcomes of the program; and the program rationale. The analyses described in this volume provide some answers to questions in each of the four areas.

In the first area--need for support for local course improvement--several specific questions were of interest. What evidence exists that institutions need outside assistance to keep up with currently important scientific and instructional developments? How do needs differ in different types of institutions and in different scientific fields?

To answer these questions, we mailed a questionnaire on instructional needs to a national sample of college teachers. Teachers who responded said that science teaching needed improvement at the college level, that the sorts of support LOCI can provide will lead to improvement of science courses, but that support of this kind is unavailable locally at the vast majority of institutions. Nearly half the respondents to our survey, for example, said that summer salary and released time for work on course improvement are sound investments that pay substantial dividends to colleges, but nearly two-thirds of all respondents said that summer salary and released time were not available at their colleges.

Perceptions of needs and resources were very similar in different areas of science, but differed somewhat at different institutions. Perceived needs were highest at community colleges, lower at four-year colleges, and lowest at universities. Resources of the type LOCI provides were perceived as more effective by teachers at community colleges and four-year colleges, and were seen as somewhat less effective by faculty members at universities. Availability of these resources was reported to be equally low by teachers at all levels of institutions.

The second major area of concern was response to the LOCI program. Specific questions in this area were: Do applicants for awards represent the full range of institutions and scientific fields? Are proposals and funded projects consistent with established needs for instructional improvement?

We doubt that many NSF programs would equal the record of the LOCI program in the diversity of its applicants. The LOCI program seemed to get a response from all segments of higher education and from all areas of science. The program's broad appeal would seem to make it a valuable one to the Foundation. Through this program, the Foundation makes contact with old friends in higher education--teachers at major research universities--and also makes new friends at colleges not traditionally involved in scientific research.

Although LOCI proposals came from diverse sources, individuals submitting proposals did not fully represent the population of eligible college science teachers. First, universities and four-year colleges submitted more proposals than their undergraduate enrollments warranted; community colleges submitted far fewer than their share of

proposals. Second, private institutions submitted more proposals than expected on the basis of their enrollments; public institutions submitted fewer. And finally, the physical sciences, mathematics, computer sciences, and engineering submitted a disproportionate share of the proposals while the biological sciences, social sciences, and psychology submitted fewer proposals than expected. Those institutions and fields submitting more than their share of proposals were not those with the greatest need or fewest resources. If anything, the opposite tended to be true. But institutions and fields submitting more than their share of proposals may be those with the strongest traditional links to NSF.

Proposals from different types of institutions and different scientific fields had about the same chance of success in NSF's review process—about one in four. Institutions and fields that submitted many proposals received many LOCI awards; institutions and fields that submitted few proposals received few awards. The review of LOCI proposals by NSF review panels therefore seemed evenhanded.

The third major area for evaluation was the outcome of the LOCI program. Here we were concerned with such questions as these: To what extent do projects achieve their objectives? Which sorts of objectives are most often achieved? What factors within projects contribute to their success? What are the most promising practices that have been developed in LOCI projects? Our data to answer these questions came from two different sources: a questionnaire survey and the final reports filed by project directors. The two data sources gave different pictures of LOCI outcomes.

Replies from a questionnaire to project directors showed that most project directors considered their projects to be very successful. The project directors reported clear benefits for their students from the projects, and most project directors also reported that the LOCI projects contributed to their professional development. When asked about the current status of their projects, nearly three-quarters of all project directors reported that their projects would be continued in either original or expanded form. Many also reported that the products of their LOCI work were being used by others either within or outside their institutions. We were unable to find any relationship between success of projects as reported by project directors and characteristics of the institutions and departments in which LOCI projects were carried out.

LOCI project directors, however, did not document their successes effectively in final reports to NSF. Only 70% of the project directors had submitted reports of any kind within a year after the reports were due. Most of the reports that were submitted were impressionistic and brief. About half lacked quantitative results, and about three-quarters lacked data from any sort of control or comparison group. Very few of the final reports demonstrated strong positive effects of LOCI projects on student achievement, satisfaction, instructional costs, or any other quantifiable instructional outcome.

The fourth major area for evaluation was program rationale. Concerns in this area included guidelines and restrictions on awards--the level of support, degree of structure, time allotted, and so on. LOCI guidelines and restrictions need especially careful examination in two areas: project evaluation and final reports.

One of the most striking impressions from our reading of 324 funded proposals was of the general weakness in the design of project evaluations. Most projects were not committed to collection of any sort of data from a control or comparison group, and without such data conclusions about the results of revisions and innovations are seldom convincing. This is surely an area where better guidelines can be written for faculty members writing proposals and for reviewers reading them.

Guidelines for final reports also may be in need of improvement. A few project directors said that they did not know what NSF's expectations for final reports were. More clarity in guidelines for reports may therefore be necessary, but LOCI also needs guidelines that would encourage project directors to submit reports with results that could be synthesized effectively by program managers. In principle, tools for quantitative synthesis of research findings are applicable to results of LOCI and other NSF funding programs. But in reality, these tools cannot be used on LOCI reports because reported results are far too impressionistic in most report. In our opinion, this area, more than any other, needs careful attention of NSF personnel.

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Appendix A

Needs Questionnaire

THE UNIVERSITY OF MICHIGAN
The Center for Research on Learning and Teaching
109 E. MADISON STREET
ANN ARBOR, MICHIGAN 48109

May 16, 1979

Dear Colleague:

The National Science Foundation has asked the University of Michigan to assist in the evaluation of its Local Course Improvement (LOCI) program. Through this program, the National Science Foundation makes awards of up to $25,000 to colleges and universities for the revision of the method and content of college science courses.

Our evaluation will focus on several different questions: Can institutions keep up with currently important scientific and instructional developments without outside assistance? Do applicants for awards represent the full range of institutions and scientific fields? To what extent do projects achieve their objectives? Are program guidelines and restrictions reasonable?

In the first part of our evaluation, we are asking a representative group of college science teachers about instructional needs at their institutions. From responses to our questionnaire, we will develop a profile of overall needs in college science teaching, and we will also determine whether needs differ in different types of institutions and in different scientific fields.

We hope that you will take the 5 to 10 minutes required to complete the enclosed questionnaire on needs in college science teaching. Please return the questionnaire in the enclosed, pre-addressed envelope by Monday, June 18. The information you supply will be treated with utmost confidence.

We can send you a summary of our findings. If you would like a summary, please complete the enclosed postcard and return it to us.

Sincerely,

James A. Kulik
Research Scientist
and Associate Director

A. NEEDS IN SCIENCE TEACHING

Listed below are nine possible needs in science teaching. By placing an X in the appropriate box, indicate how strong a need you consider each need to be in your field at your institution at the present time.

In your judgment, how strong a need is there for each of the following in your field at your institution at the present time?	no need at all	slight need	moderate need	strong need
1. Revising content of undergraduate courses to incorporate new developments in your field.				
2. Increasing the use of instructional technologies, such as computer-assisted instruction, instructional video, etc.				
3. Increasing the use of individualized instruction, such as tutorials, self-paced study, mastery learning, etc.				
4. Developing new educational programs geared to recent scientific and technical developments.				
5. Increasing the number of students who truly master the content of courses.				
6. Increasing student satisfaction with courses.				
7. Increasing undergraduate enrollments.				
8. Decreasing dropouts from courses.				
9. Providing opportunities for continuing education for adults in the community.				

Con[illegible]

B. RESOURCES FOR IMPROVING UNDERGRADUATE SCIENCE COURSES

Listed below are six resources that institutions might use to improve undergraduate courses. Please respond to each resource in two ways. First, indicate how effective you consider the resource to be in improving college teaching. Then indicate the availability of the resource to teachers in your field at your institution.

For each item, place an X in the appropriate box after effectiveness and another X in the appropriate box after availability.		not at all	low	medium	high
1. Released time during the academic year for working on course improvement.	Effectiveness				
	Availability				
2. Summer salary for working on course improvement.	Effectiveness				
	Availability				
3. Funds to support travel related to the improvement of teaching.	Effectiveness				
	Availability				
4. Small grants to support teaching innovation.	Effectiveness				
	Availability				
5. Consultation with specialists on teaching improvement.	Effectiveness				
	Availability				
6. Paid assistants (e.g., graduate students or technicians to help faculty working on course improvement)	Effectiveness				
	Availability				

Comments:

PLEASE CONTINUE ON THE NEXT PAGE

C. OTHER

Please answer the following questions about your academic background.

1. What is your highest completed degree? (Mark one answer only.)

- ☐ Bachelor's
- ☐ Master's
- ☐ Doctorate
- ☐ Other, specify _____

2. What is your academic field of specialization? _____

3. What is your academic rank? (Mark more than one, if applicable.)

- ☐ Instructor
- ☐ Assistant professor
- ☐ Associate professor
- ☐ Professor
- ☐ Department chairperson
- ☐ Administrator (e.g., vice-president, dean, director of counseling center, etc.)
- ☐ Specify _____

4. Did you teach at least one undergraduate course during the academic year 1978-79?

- ☐ No
- ☐ Yes

THANK YOU VERY MUCH FOR YOUR COOPERATION.

Appendix B

Outcome Questionnaires

The Center
For Research on Learning
And Teaching
109 E. Madison
Ann Arbor, Michigan 48109

April 5, 1979

Dear Colleague:

The National Science Foundation has asked The University of Michigan to assist in the evaluation of its Local Course Improvement (LOCI) program. Through this program, the National Science Foundation makes awards of up to $25,000 to colleges and universities for the revision of the method and content of college science courses. Before 1977, these awards were known as faculty-oriented awards in NSF's program on Restructuring the Undergraduate Learning Experience (RULE). As a recipient of a LOCI or RULE award, you can help us in this evaluation.

Our evaluation will focus on several different questions: Can institutions keep up with currently important scientific and instructional developments without outside assistance? Do applicants for awards represent the full range of institutions and scientific fields? To what extent do funded projects achieve their objectives? Are program guidelines and restrictions reasonable?

In evaluating the outcomes of funded projects, we need your cooperation. You can help by providing information about your project: your assessment of project outcomes (green questionnaire) and an assessment of project outcomes by your department or division head (blue questionnaire).

Your assessment of project outcomes: We hope that you will take the 5-10 minutes needed to fill out the enclosed green questionnaire on project outcomes. You may return the questionnaire in the enclosed, pre-addressed envelope. We also hope that you will send us any reprints, preprints, or reports that you have available on your project activities.

Assessment of project outcomes by your department or division head: Please give a copy of the enclosed blue questionnaire and a return envelope to your department or division head.

We can send you a summary of our findings. If you would like to receive a report, please complete the enclosed postcard and return it to us.

Please return your questionnaire by Monday, April 30, 1979. The information you supply will be treated with utmost confidence. If you have any questions about our study or about the questionnaires, call me collect at (313) 764-0505.

Sincerely,

James A. Kulik

James A. Kulik
Research Scientist and
Associate Director

University of Michigan

THE UNIVERSITY OF MICHIGAN
The Center for Research on Learning and Teaching
109 E. MADISON STREET
ANN ARBOR, MICHIGAN 48109

ASSESSMENT OF OUTCOMES BY PROJECT DIRECTOR

This questionnaire contains a number of questions about the outcomes of your LOCI (or RULE) project. It will take about 5 to 10 minutes to complete. Please return the questionnaire in the enclosed, pre-addressed envelope by Monday, April 30. The information you supply will be treated with utmost confidence. If you have any questions about this survey, please call James Kulik collect at (313) 764-0505.

OVERALL EVALUATION

1. Please indicate your overall evaluation of your project by placing an X in the appropriate box for each question.

	DEFINITELY NOT (1)	PROBABLY NOT (2)	UNCERTAIN (3)	PROBABLY YES (4)	DEFINITELY YES (5)
a. Do you consider your LOCI project a success?					
b. Was your LOCI project worth the effort to you?					
c. Would you consider another LOCI project?					
d. Do faculty in your department or division consider your LOCI project a success?					

INSTRUCTIONAL OUTCOMES

2. Approximately how many undergraduate students per year were affected by your project?

About _____ students each year

3. Please indicate the extent to which your project has contributed to instructional effectiveness in the following areas. For each item place an X in the appropriate box.

	NOT AT ALL (1)	SLIGHTLY (2)	CONSIDERABLY (3)	TO A GREAT EXTENT (4)
a. More students learned the material.				
b. Students retain what they learn longer.				
c. Students enjoyed the experience more.				
d. Students learned something different.				
e. Course or program enrollments increased.				
f. Course or program dropouts decreased.				
g. Institution's service to its community increased.				
h. Instructional costs (per student) decreased.				

FACULTY DEVELOPMENT

4. Please indicate whether the following changed as a result of your LOCI award. For each item place an X in the appropriate box.

	DECREASED A GREAT DEAL (1)	DECREASED A MODERATE AMOUNT (2)	STAYED ABOUT THE SAME (3)	INCREASED A MODERATE AMOUNT (4)	INCREASED A GREAT DEAL (5)
a. Your general effectiveness as a teacher.					
b. Your sense of professional satisfaction.					
c. Your involvement in teaching improvement on campus.					
d. The extent to which other faculty have contacted you about teaching improvement.					

CURRENT STATUS OF PROJECT

5. Please describe the status of your project by responding to the following questions.

a. Which of the following descriptions best characterizes the present state of the results of your project? (Check the one most appropriate description.)

- ☐ It will be continued in an expanded form.
- ☐ It will be continued in its original form.
- ☐ It will be continued, but with reduced scope.
- ☐ It was or will be cancelled.

b. To your knowledge, is the program or course you developed being used in whole or in part by other instructors? (Check any categories for which your answer is "yes.")

- ☐ In your department.
- ☐ In other departments at your institution.
- ☐ In other colleges or universities.

PLEASE CONTINUE ON THE NEXT PAGE

OTHER

6. Please complete the following.

a. What is your academic field of specialization? _____

b. What is your academic rank? (Check more than one, if applicable.)

- ☐ Instructor
- ☐ Assistant professor
- ☐ Associate professor
- ☐ Professor
- ☐ Department chairperson
- ☐ Administrator (e.g., vice-president, dean, director of counseling center, etc.)
- ☐ Specify _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.

THE UNIVERSITY OF MICHIGAN
The Center for Research on Learning and Teaching
109 E. MADISON STREET
ANN ARBOR, MICHIGAN 48109

April 5, 1979

Dear Colleague:

The National Science Foundation has asked The University of Michigan to assist in the evaluation of its Local Course Improvement (LOCI) program. Through this program, the National Science Foundation makes awards of up to $25,000 to colleges and universities for the revision of the method and content of college science courses. Before 1977, these awards were known as faculty-oriented awards in NSF's program on Restructuring the Undergraduate Learning Experience (RULE). As the head of a department or division which received support for a LOCI or RULE project, you can help us in this evaluation.

Our evaluation will focus on several different questions: Can institutions keep up with currently important scientific and instructional developments without outside assistance? Do applicants for awards represent the full range of institutions and scientific fields? To what extent do projects achieve their objectives? Are program guidelines and restrictions reasonable?

To evaluate the outcomes of LOCI or RULE projects, we need your cooperation. We hope that you will take the 5 to 10 minutes needed to fill out the attached questionnaire on project outcomes. Please return the questionnaire in the attached, pre-addressed envelope by Monday, April 30.

The information you supply will be treated with utmost confidence. If you have any questions about our study or about the questionnaire, I wish you would call me collect at (313) 764-0505.

Sincerely,

James A. Kulik
Research Scientist
and Associate Director

OVERALL EVALUATION

1. Please indicate your overall evaluation of the project by placing an X in the appropriate box for each question.

	DEFINITELY NOT (1)	PROBABLY NOT (2)	UNCERTAIN (3)	PROBABLY YES (4)	DEFINITELY YES (5)
a. Was the LOCI project in your department a success?					
b. Was the LOCI project worth the effort of your faculty?					
c. Would members of your department consider another LOCI project?					
d. Do faculty in your department or division consider the LOCI project a success?					

INSTRUCTIONAL OUTCOMES

2. Approximately how many undergraduate students were affected by the LOCI project?

About _____ students each year

3. Please indicate the extent to which the project has contributed to instructional effectiveness in the following areas. For each item place an X in the appropriate box.

	NOT AT ALL (1)	SLIGHTLY (2)	CONSIDERABLY (3)	TO A GREAT EXTENT (4)
a. More students learned the material.				
b. Students retain what they learn longer.				
c. Students enjoyed the experience more.				
d. Students learned something different.				
e. Course or program enrollments increased.				
f. Course or program dropouts decreased.				
g. Institution's service to its community increased.				
h. Instructional costs (per student) decreased.				

FACULTY DEVELOPMENT

4. Please indicate whether the following changed as a result of the LOCI project. For each item place an X in the appropriate box.

	DECREASED A GREAT DEAL (1)	DECREASED A MODERATE AMOUNT (2)	STAYED ABOUT THE SAME (3)	INCREASED A MODERATE AMOUNT (4)	INCREASED A GREAT DEAL (5)
a. Project director's general effectiveness as a teacher					
b. Involvement of project director in teaching improvement on campus.					

CURRENT STATUS OF PROJECT

5. Which of the following descriptions best characterizes the present state of the results of the project? (Check the one most appropriate description.)

- ☐ It will be continued in an expanded form.
- ☐ It will be continued in its original form.
- ☐ It will be continued, but with reduced scope.
- ☐ It was or will be cancelled.

6. To your knowledge, is the program or course the teacher developed being used in whole or in part by other instructors? (Check any categories for which your answer is "yes.")

- ☐ In your department.
- ☐ In other departments at your institution.
- ☐ In other colleges or universities.

OTHER

7. What is your academic position? (Check more than one if applicable.)

- ☐ Department chairperson
- ☐ Division chairperson
- ☐ Administrator (e.g., vice-president, dean, director of counseling center, etc.)

Specify _____

THANK YOU VERY MUCH FOR YOUR COOPERATION.