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ABSTRACT

In April 1983, a questionnaire on the evaluation of remedial mathematics programs wax distributed to all mathematics chairpersons of American institutions of higher education. About 650 (25%) of the institutions responded, yielding information on more than 500 remedial programs and 250 evaluations. The survey dealt with four general areas of inquiry: (1) the responding institutions and their college-level mathematics requirements; (2) the remedial mathematics programs; (3) the most rigorous evaluations of these programs conducted to date; and (4) reactions to these evaluations. Twenty-four major results are listed in the summary. Less than half of the responding colleges require all students to take a cursee in college-level mathematics, although most require either a course or meeting a distribution requirement that includes mathematics. Remedial mathematics programs are offered by 86%. Most of the other results concern the content of the programs and their evaluations. Recommendations are included, and tables summarize the data. (MNS)

RESEARCH MONOGRAPH SERIES
REPORT NO. 10

METHODS OF EVALUATING COLLEGE REMEDIAL MATHEMATICS PROGRAMS:

RESULTS OF A NATIONAL SURVEY

May 1985

Instructional Resource Center
Office of Academic Affairs
The City University of New York
535 East 80th Street
New York, New York 10021

The American Mathematical Association of Two-Year Colleges

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METHODS OF EVALUATING COLLEGE REMEDIAL MATHEMATICS PROGRAMS: RESULTS OF A NATIONAL SURVEY

Research Monograph Series
Report No. 10

May 1985

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Our thanks then to both CUNY and AMATYC for supporting this project, and particularly to Marie Jean Lederman, University Dean and Director of the IRC, and Amber Steinmetz, president of AMATYC.

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SUMMARY OF THE FINDINGS

In April 1983, a questionnaire on the evaluation of remedial math programs (RMP's) was distributed to all math chairpersons of American institutions of higher education. About 650 (25%) of the chairpersons (or their designees) responded, yielding information on more than 500 remedial math programs and 250 RMP evaluations. The survey dealt with four general areas of inquiry: (1) the responding institutions and their college-level math requirements, (2) the RMP's, (3) the most rigorous evaluations of their RMP's conducted to date, and (4) reactions to these evaluations.

Major Results

- Less than half (40%) of responding colleges require all their students to take a course in college-level mathematics. However, most institutions mandate that at least some students either take a math course or meet a distribution requirement which includes the option of college-level mathematics.

- 86% of all responding colleges offer RMP's. The proportion is even higher in public two-year institutions (99%), but somewhat lower in private four-year institutions (74%).

- The typical RMP was established in the mid 1970's, although some 4% predate 1960. RMP's tended to be established earliest in public two-year colleges, and most recently in private four-year colleges.

- The most common goal (90%) of remedial math programs is to help students prepare for subsequent college-level math courses. Other goals include preparation for subsequent science or technical courses (49%), and preparation to meet a college, university or system-wide standard of competency (39%).

- The RMP curriculum is generally carved out of topics taught in the secondary and primary schools. The most commonly taught content areas in RMP's are elementary algebra (87%), arithmetic (76%), intermediate algebra (52%), trigonometry (21%), plane geometry (15%), and pre-calculus (14%). The RMP's of more selective institutions are more likely to cover higher levels of math such as pre-calculus; less selective institutions are more likely to deal with lower levels such as arithmetic.

- The typical RMP consists of two different courses, although about 10% are composed of 5 or more courses. Older programs tend to consist of more courses than newer ones.

- Nationally, responding colleges with RMP's judge more than 1 out of every 3 freshmen to be in need of RMP courses. At 1/3 of responding institutions with RMP's, more than half the freshmen are considered to be mathematically unprepared.

- Colleges typically employ several measures of mathematical proficiency in developing a student's placement profile. Incoming freshmen are

most commonly placed into RMP courses on the basis of their scores on one or more tests (92%). The instruments employed vary -- some colleges use locally developed tests (53%), some administer commercially distributed placement tests (31%), and others place on the basis of an admissions test (44%). In addition, nearly half (48%) of colleges take into account the high school records of students in assigning them to RMP courses.

- At nearly half (41%) of responding colleges with RMP's, all students judged to be mathematically unprepared are mandated to take RMP courses.

- The median RMP enrollment is 125. Most of the larger programs, with enrollments exceeding 1000, are housed in public two-year colleges.

- About 1/8 of the responding institutions report that they usually offer an insufficient number of RMP sections to accommodate student demand; these shortages are most common at public institutions.

- Nearly half (49%) of responding institutions with RMP's report that their programs have been evaluated -- a much higher rate than reported in a national survey conducted ten years earlier.

- Institutions at which all students are required to take college-level math courses are very likely to have evaluated their RMP's, as well as institutions which use tests for placement, which practice mandatory placement, and which maintain placement records.

- Less than half (40%) of RMP evaluations were carried out as the result of requests from outside the program; only about 1 out of 8 evaluations resulted from requests from outside the college.

- Relatively few (9%) RMP evaluations used an outside evaluator.

- The vast majority (86%) of evaluations were conducted without the benefit of special funds allocated for the purpose. Where special funding was available, the most common sources were the college administration (46%) and governmental units and agencies (37%).

- RMP evaluations tend to be more product- than process-oriented: whereas 88% involved an analysis of the effects of the program on student performance, only 51% examined the policies and practices followed in the RMP.

- More than 9 out of every 10 RMP evaluations dealt with the effectiveness of RMP courses. Among the other concerns which evaluations addressed were: the effectiveness of the RMP placement system (74%), the appropriateness of the RMP curriculum (59%), and directions in which the RMP should be modified (56%).

- The typical evaluation employed several distinct kinds of evaluative data, most commonly: RMP grades (81%), test scores (73%), grades earned subsequently in college-level math courses (72%), student opinion of the RMP (49%), college retention rates (44%), RMP faculty

opinion of the program (41%), student attitudes toward mathematics (27%), grades earned in subsequent science/technical courses (17%), non-RMP faculty opinion of the program (17%), college graduation rates (13%), and the judgment of visiting experts (8%).

- The most frequently used evaluation designs were: a comparison of students before and after the RMP (58%), a comparison of students who completed the RMP with those who had initially been exempted (40%), a comparison of students who completed RMP courses with those who had needed but not taken them (24%), and a comparison of recent RMP completers with previous RMP completers (10%). Only 7% employed a comparison involving national norms, while a mere 3% compared students exiting from the local college's RMP with those leaving another college's RMP.

- Respondents were generally satisfied with the design (74%) and the conduct (81%) of their RMP evaluations, as long as the evaluations involved a comparison of student outcomes. However, a number of respondents noted reservations about the evaluations, mentioning such problems as the subjectivity or superficiality of the data, the lack of access to or availability of data, poor cooperation from various segments of the college community, design or measurement inadequacies, the smallness of the sample, the insufficiency of available resources, and deficiencies of the evaluator.

- Most evaluations included suggestions for modifying the RMP -- suggestions which generally were implemented. These suggestions dealt with many aspects of RMP's including: reconsidering placement criteria, changing the instructional method, redesigning courses or course sequences, modifying the curriculum, altering exit criteria, creating a math lab, reconsidering program goals, and adopting new curricular materials.

- Only one respondent reported an evaluation which included the recommendation that the RMP be continued, suggesting that the continuation of other programs was generally taken for granted.

- Respondents advised future evaluators of RMP's to: plan ahead, use an outside evaluator, identify program needs, use appropriate statistical analyses and designs, get faculty and administrative support, seek certain characteristics in the evaluator, and look at passing rates in non-remedial courses.

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INTRODUCTION

It is the rare program coordinator who, confronted with the task of evaluating his or her program, looks on the project with unbridled enthusiasm. For one thing, an evaluation, if taken seriously, can be extremely time-consuming, draining badly needed resources from more immediate concerns. There is also the nagging suspicion that the study's results may lack validity, either because of the inappropriateness of the questions addressed or the flaws in the procedures followed. Even when the recommendations made are clearly valid, there may also be the fear that they will never be implemented -- that they are simply the result of a noble but idle exercise. And finally, coordinators, sensitive to their vulnerability, may be wary of exposing the weaknesses of their program.

Yet it is undeniable that there is intense interest among program coordinators on the subject of program evaluation, as evidenced by the large turnout typical at professional meetings dealing with the subject. Most administrators and faculty seem to want to know how they and their programs are doing and would like to find ways to improve them. This is particularly true in the area of basic skills instruction, for a number of reasons. For one thing, the use of experimental instructional techniques in remediation, even though widespread, is still controversial. More importantly, the very goals of the programs are sometimes looked upon as alien to the mission of the college, drawing special fire to the programs and their effectiveness. On some campuses, the importance and size of the developmental program may be so enormous that its evaluation ranks high at the Office of Institutional Research. Finally, basic skills programs are frequently financed, at least in part, by outside funds, the granting of which requires some kind of systematic evaluative effort -- the so-called "pit in the plum."

For mathematics faculty embarking upon the project of evaluating their remedial mathematics program (RMP), defining the parameters of the task ahead may be more than a little perplexing. True, such pertinent skills as the ability to construct a mathematical model or to conduct statistical analyses may well be in their bag of tricks. However, the lack of definition in the task itself -- the lack of consensus as to what constitutes a valid evaluation -- may be offensive to the mathematician's sensibilities. A torrent of questions must be confronted. To begin with, how can one attach a precise and operational meaning to such nebulous but pivotal terms as "evaluate" and "good"? What evaluative questions need to be raised? Should one take a statistical and empirical approach -- analyzing data on student achievement -- or instead invite a blue-ribbon panel of purported experts to assess the program? What kinds of measurements if any should be taken, and in comparison to what standard should the measurements be judged?

The questions seem endless. To what extent must the achievement of program goals be the focus of the evaluation? Where multiple goals exist, how ought they to be prioritized? How much should affective factors, such as student or faculty attitudes, be considered, as opposed to those factors which are strictly cognitive? Should one take a holistic perspective, concluding that the program is good or bad or something in between, or a more analytic stance -- the placement mechanism and the

textbook work well but pedagogical strategies need rethinking. Where the thrust of the evaluation is a search for program strengths and weaknesses, how can one identify appropriate directions for improvement? And what about cost-effectiveness: while math faculty will be interested in test scores and course grades, administrators may focus more on a program's cost than its value.

With all these debatable points, it is no wonder then that the literature gives one the impression of tremendous diversity among past RMP evaluations, a diversity that covers a multitude of sins. Several efforts have been made to introduce some order to this chaos (e.g., Akst and Hecht 1981, Smith and Schavio, n.d.). Wolf's analysis (1979), in particular, is valuable for the insight which it provides into common methodological abuses.

Wolf writes of five methods of program evaluation. In his cosmetic method, the evaluator takes a cursory look at the program, and decides if it looks good. In cardiac evaluation, one looks at the program and decides in one's heart how well the program is doing (somewhat similar, he notes, to the use of subclinical findings in medical research). An advocate of the colloquium school of evaluation goes about his or her job assembling a group of people associated with the program to discuss its effectiveness until some kind of consensus emerges. In the curricular method, a new program is judged to be sound to the degree that it disturbs any existing programs, arrangements or schedules as little as possible. Finally, there is the computational method, in which it is considered desirable to actually gather evidence about how a program affects student performance; here a program is judged successful not to the degree that the data show evidence that the goals were achieved, but rather when two or more analyses of the data yield the same result.

While most evaluations in the real world no doubt transcend this taxonomy, it is also true that those individuals responsible for designing and conducting RMP evaluations have not always chosen the most rigorous approach. For example, we know of at least one published study which dealt with a remedial math program that had been designed to exhibit the characteristics advocated by a particular national "expert." The evaluation, conducted by the program coordinator himself, simply ascertained the extent of overlap between the program's characteristics and those advocated by the expert! Then again, there are those investigations which have as their objective less the assessing of a program's intrinsic merit than whitewashing to protect jobs and to improve funding. More broadly, Cross (1979), the country's most distinguished researcher in the area of developmental education, describes the history of remedial evaluation (at least through the 60's) as riddled with methodological flaws, emotionalism and politization. Other observers are equally critical (Piesco 1978, Robinson 1950).

It is not the purpose of this monograph to provide the authors with a platform from which to promulgate their own views on the aforementioned methodological issues. Rather, our goal -- less ambitious but more concrete -- is simply to document the extent and nature of the evaluative activity being conducted throughout the nation on college RMP's, as well as to gather personal reactions to RMP evaluations from

those who have gone through the experience. As far as we know, this effort is the first of its kind. While the literature contains a number of surveys on RMP's (e.g., Jorgensen 1981, Lindberg 1976, Baldwin 1975), they have dealt only peripherally with RMP evaluation.

The present monograph is divided into five chapters. The first discusses the methodology which we employed in carrying out our study. The second chapter focuses on the context in which the reported evaluations took place: here we describe the sample of some 700 institutions, their college-level graduation requirements in mathematics, and most importantly, the RMP's themselves. Even readers not principally interested in the subject of program evaluation may find this descriptive information of interest. The third chapter focuses on our primary concern, namely RMP evaluation -- the characteristics of colleges whose programs were evaluated and the kinds of evaluative activities which were conducted. The fourth deals with evaluation consequences, associated problems, and reactions. And, in the final chapter, we present some conclusions relating to this investigation.

SURVEY METHODOLOGY

Questionnaire Development and Distribution

In trying to document the patterns of evaluative strategies employed in remedial math programs around the country, we saw from the outset that whatever questionnaire we developed would have to deal not only with the RMP evaluations themselves but also with the context in which they took place. In the end, we developed a questionnaire (Appendix) which dealt with four areas of inquiry:

(1) the responding institutions
(2) their RMP's
(3) the RMP evaluations, and
(4) the reactions to the evaluations.

In drafting the questionnaire, we had to take a stand on a number of issues which would, to a considerable extent, shape the results of the survey. For example, an issue which surfaced immediately was whether to impose precise meanings on such pivotal terms as "remedial" and "evaluation." In the end, we decided not to. Instead, we chose to accord our respondents the widest degree of latitude in interpreting these terms, not only because we hoped to gain in breadth of replies what we would lose in uniformity, but also because we were genuinely interested in what meaning would be attached to the terms. However, when there had been more than one evaluation, we did not allow respondents the latitude to select which evaluation to comment on. Because we wanted to focus on their best evaluative efforts, we requested information about each respondent's most thorough evaluation conducted to date.

A less momentous but equally pragmatic issue that arose was the extent to which we should include open-ended items on the questionnaire. The advantage of a closed-ended (multiple-choice) format includes a greater likelihood of obtaining a higher response rate and of collecting, at least superficially, comparable data which are more easily tabulated and analyzed. The advantage of an open-ended format includes the possibility of yielding a more accurate reflection of the truth, with minimal restrictions stemming from the investigators' preconceptions. In the end, we chose to employ both types of items, adopting the open-ended format when we were least confident of developing suitable options. In addition, we left room for extra comments by the closed-ended items, and also included a request for copies of any available evaluation reports.

In April 1983, we distributed the questionnaire to each of the approximately 2,800 American institutions of higher education admitting first-year undergraduate students. Because we knew from previous surveys that RMP's are generally housed in mathematics departments, we mailed the questionnaires to math chairpersons, requesting that they forward their copy to the appropriate party on their campus.

Sample

About 650 (25%) of the institutions which were contacted responded. In attempting to gauge the extent to which characteristics of our responding sample resemble those of the entire surveyed population, we compared the two groups along three standard dimensions for which national data were available -- type of institution (level and control), size of institution (as measured by undergraduate enrollment), and the geographical region in which the institution is located.

This analysis showed that the institutions in our sample are located in regions of the country in roughly the same proportions as the totality of colleges nationwide (Table A1), but that there are some differences between the sample and population in terms of other variables. Compared to the national population, our sample contains something of an overrepresentation of public four-year colleges and an underrepresentation of private four-year colleges (Table A2). However, the degree of distortion does not seem serious, and the ranking of institutional categories in terms of both level and control follows the same order as in the general population. Consistent with this bias, we also noted a discrepancy between sample and population in terms of institutional size -- our sample contains an underrepresentation of small institutions and an overrepresentation of large ones (Table A3).

Overall, we think that the major trends which the results of our survey suggest are likely to hold in the institutional population at large, particularly among those colleges which have an active interest in basic skills programs.

Procedures

To analyze the responses to our open-ended questions, we developed a coding system and coded each open-ended response twice to ensure high reliability.

We analyzed the data in a variety of ways. First, we computed response distributions for each item on the questionnaire, in terms of both frequencies and percents. We then performed cross tabulations on all variables which we thought might be related, computing values of the chi square statistic in order to gauge the statistical significance of differences. In an effort to be consistent with other studies of postsecondary institutions, we often partitioned our responding institutions by type of institution (level and control).

Our major findings are presented in the body of the monograph, while less important ones are given in the Appendix.

BACKGROUND: THE COLLEGES AND THEIR REMEDIAL MATH PROGRAMS

The Colleges

The nature of an institution may well impinge on our major concerns -- whether the institution offers a remedial mathematics program, whether it chooses to evaluate its RMP, and, if so, what particular methodology it selects for the evaluation. In order to gain some insight into the nature of our responding institutions, we examined them from the point of view of a number of variables including their level (two-year or four-year), type of control (public or private), the region in which they are located, their size, and their college-level math requirements.

In terms of level and control, our largest category of responding institutions is private four-year colleges (33%), followed by public two-year colleges (31%), public four-year colleges (25%), private two-year colleges (6%), and other (4%) (Table 1). Thus, the proportions in our sample in the categories of public two-year, public four-year, and private four-year colleges are fairly comparable. Our responding institutions are distributed throughout the country -- approximately 30% of the respondents are from the Great Lakes/Plains region, with the remainder spread fairly evenly among the West/Southwest (22%), the Southeast (24%) and the North/Atlantic (24%) (Table 2).

Because public institutions tend to be larger than private ones, it is not surprising that the sizes of our responding institutions vary significantly when grouped by type of institution. Public four-year colleges are on the average the largest (their median enrollment is 6,000), followed by public two-year colleges (with a median enrollment of 3,550), private four-year colleges (1,200), and private two-year colleges (400) (Table 3).

We also looked at the non-remedial mathematics curricula of our respondents and found that most colleges require college-level math courses for at least some of their students -- only 4% do not. Aside from distribution requirements, almost three-fourths require college-level math courses either for all students (40%) or for students in certain majors (34%) (Table 4). When we examined requirements for college-level mathematics by type of institution, we saw that public two-year institutions are least likely to require all students to take college-level mathematics -- perhaps because of students in non-transfer, technical "tracks." Only 23% of these institutions require all students to take college-level math, while 59% of public four-year institutions have such requirements. On the other hand, over half of public two-year institutions require students in certain majors to take college-level mathematics, as compared to less than 30% for other types of institutions (Table 5), perhaps another reflection of the system of tracks in two-year colleges.

The Remedial Mathematics Programs

Before beginning our investigation into the ways in which colleges have assessed their remedial math efforts, we need to take a brief look at the object of their scrutiny, namely the remedial mathematics programs

Table 1

Percent of Institutions of Various Types

(n=656)

Public 2-year	31%
Private 2-year	6%
Public 4-year	25%
Private 4-year	33%
Other	4%
Total	100%

Table 2

Percent of Institutions in Various Regions

(n=648)

Region	
West/Southwest	22%
Southeast	24%
Great Lakes/Plains	30%
North-Atlantic	24%
Total	100%

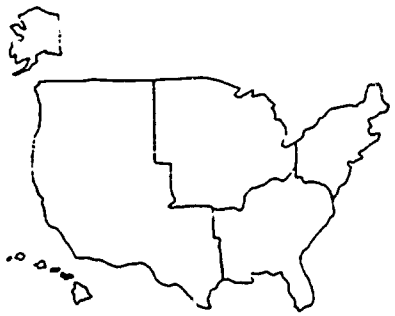

Table 3

Percent of Institutions with Various College Enrollments by Type of Institution

	College Enrollment			
	Up to 1000	1001-5000	5000+	Median
Public 2-year (n=198)	17%	46%	37%	3550
Private 2-year (n=39)	87%	10%	3%	400
Public 4-year (n=162)	7%	38%	56%	6000
Private 4-year (n=217)	43%	51%	6%	1200
Total (n=616)	28%	43%	29%	2200

$P(X^2)=.00$*

*A small $P(X^2)$, the probability of chi-square, provides evidence that the differences between the percents in the table are not likely to be due to chance. It is customary in educational research to use either .05 or .01 as the critical level of significance (Ary et al. 1972).

Table 4

Percent of Institutions with Various Student Populations Required to Take College-level Math

(n=541)

Student Populated Required	
All Students	40%
Certain Majors	34%
Distribution Requirements/All Students	11%
Distribution Requirements/Certain Majors	5%
No Students	4%
Other	7%
Total	100%

Table 5

Percent of Institutions with Selected Student Populations Required to Take College-level Math by Type of Institution

	Student Population Required	
	All Students	Certain Majors
Public 2-year (n=198)	23%	52%
Private 2-year (n=39)	40%	25%
Public 4-year (n=162)	59%	29%
Private 4-year (n=217)	43%	21%
Total (n=616)	39%	34%

themselves. While our survey in no way purports to provide a comprehensive description of RMP's, we did take pains, within space limitations, to explore some aspects of RMP's, especially those that we thought might impinge on a college's evaluative activities. Thus, the questionnaire which we constructed includes items relating to program goals as well as to various program practices.

To begin with, our results indicate that 86% of American colleges offer remedial math courses (Table 6), identical to the figure reported in a recent national survey (Lederman, Ryzewic and Ribaudo 1983). Among public colleges, many of which practice non-selective admissions, virtually all (99%) two-year institutions have RMP's, as do 91% of four-year colleges. In the private sector, three fourths of four-year colleges offer courses in basic mathematics, followed by two-year institutions with only 71%. Note that whether an institution is public or private seems to play a more important role in determining the likelihood of its offering remedial math courses than whether its level is two- or four-year.

A college's decision to offer math remediation may depend not only on characteristics of its student body but also on its mission, college-level curriculum, finances, and many other factors. We therefore examined the colleges in our sample from a number of perspectives besides level and type of control.

For example, we wondered whether large institutions tend to offer remedial math courses more often than small ones; such a trend might be the case not only because the student bodies of large institutions, by virtue of their size, are more likely to contain some mathematically weak students, but also because these institutions are frequently public and less selective in their admissions policy (Lederman, Ryzewic and Ribaudo 1983). In fact, a clear pattern with respect to size does emerge from our data: larger institutions (as measured by college enrollment) are more likely to offer remedial math courses than smaller ones (Table 7). Another predictable result is that colleges which have a college-level graduation requirement in mathematics for all students are more likely to have an RMP than those at which math is not required of any student for graduation (Table A4).

While a small proportion of colleges report that their RMP's go back to the 1950's and even earlier (two responding institutions in the midwest and the south have programs which predate the Civil War!), the typical RMP opened its doors in the 1970's (Table 8). It seems clear that the growing emphasis on educational access, the proliferation of open admissions colleges, and the trend toward lowering high school exit standards in the late 60's and early 70's contributed to this growth (Akst 1985, Adelman 1982). Although the rate of proliferation of RMP's has declined in the present decade (perhaps the market is nearly saturated), new ones continue to appear, with some 75 in our sample (about 1 in 6) founded since 1980.

The public two-year colleges -- many of them open-admissions institutions founded in the 1960's -- tended to develop RMP's early; in fact, some 3/4 of their programs predate the median year of 1975 (Table 9). By contrast, the private four-year colleges, which did not

Table 6

Percent of Institutions Which Offer Remedial Math Courses by Type of Institution

Public 2-year (n=198)	99%
Private 2-year (n=38)	71%
Public 4-year (n=162)	91%
Private 4-year (n=219)	74%
Total (n=617)	86%

$P(X^2)=.00$

Table 7

Percent of Institutions Which Offer
Remedial Math Courses by College Enrollment

College Enrollment	
Up to 1000 (n=198)	76%
1001-5000 (n=210)	87%
5000+ (n=204)	95%
Total (n=612)	86%

$P(X^2)=.00$

Table 8

Percent of RMP's Which Began in Various Time Spans

(n=459)

The Year the RMP Began	
Before 1960	4%
1960-1964	6%
1965-1969	14%
1970-1974	25%
1975-1979	33%
1980 and Later	17%
Total	100%

Table 9

Percent of RMP's Which Started Before 1975 by Type of Institution

Public 2-year (n=157)	74%
Private 2-year (n=23)	35%
Public 4-year (n=132)	42%
Private 4-year (n=129)	29%
Total (n=441)	49%

extend a welcome as early or as freely to non-traditional students, developed basic math programs rather late, with nearly 3/4 of their RMP's under 10 years of age.

Perhaps the key to understanding the national RMP movement lies in developing an appreciation of RMP goals. In our survey, the goal most commonly reported is to help students prepare for subsequent math courses (Table 10). The implication is that students were and are being admitted into college unable to succeed in the regular math curriculum without some sort of special preliminary assistance. About half our respondents also reported that a major goal of their program is to offer students some kind of bridge experience for subsequent science and technical courses. However, this goal seems usually to be of secondary importance (Table A5) and is generally confined to public two-year colleges, with their specialized occupational and technical curricula (Table A6). In addition, more than a third of our respondents reported that a major RMP goal is to prepare students to reach a proficiency standard. No doubt, this extension of the minimal competency trend from high schools to colleges represents an effort to bolster the integrity of the college degree. A small number of respondents wrote in additional program goals: to teach students to enjoy mathematics, to help them in their personal growth, to promote math or computational "literacy," to satisfy the administration, to help students pass the GED exam, to promote their general education, and to prepare them for work or everyday life. Furthermore, over half the institutions (59%) indicated multiple goals, creating at least the potential for conflict in curricular development. For example, there may be constant tension over the curriculum of an algebra course which is meant to prepare students to pass both a subsequent math course and a competency test, unless the demands of the two are identical.

As a rule, the curriculum of RMP's consists of areas of mathematics traditionally covered in the secondary or even primary school (Table 11). Thus, the most commonly taught content areas are elementary algebra (87%) and arithmetic (76%). Also, half the respondents (52%) cover intermediate algebra in their programs, followed by trigonometry (21%), and plane geometry (15%). It's worth noting that some 14% of RMP's count more advanced material such as pre-calculus as remedial. In addition, a small number of respondents wrote in the following curricular areas: business and consumer mathematics, the use of calculators, overcoming math anxiety, "pre-algebra," solid geometry(!), statistics, probability, and analytic geometry.

As one would expect, there is a tendency for the more selective institutions to cover higher levels of mathematics in their RMP's. For example, the proportion of private four-year colleges considering pre-calculus to be remedial is more than double the corresponding figure for public two-year institutions (Table 12), which instead tend to view pre-calculus as part of their regular college curriculum (Fey, Albers and Fleming 1981). Conversely, only about half the private four-year institutions offer arithmetic in their developmental programs, whereas virtually all public two-year colleges include arithmetic in their basic math curriculum.

Table 10

Percent of RMP's with Various Goals

(n=553)

Goal	
To Prepare For:	
Subsequent Math Courses	90%
Subsequent Science/Technical Courses	49%
A Standard of Competency	39%
Other	6%

Table 11

Percent of RMP's Which Cover Various Curricular Areas

(n=554)

Arithmetic	76%
Elementary Algebra	87%
Intermediate Algebra	52%
Trigonometry	21%
Plane Geometry	15%
Pre-calculus	14%
Other	6%

Table 12

Percent of RMP's Which Cover Selected Curricular Areas by Type of Institution

	Arithmetic	Intermediate Algebra	Pre-calculus
Public 2-year (n=195)	96%	49%	10%
Private 2-year (n=27)	85%	37%	4%
Public 4-year (n=148)	66%	57%	14%
Private 4-year (n=162)	59%	54%	22%
Total (n=532)	76%	52%	14%
$P(X^2)$	.00	.17	.01

RMP's vary widely in size and organizational complexity. While the programs typically consist of two courses, about 10% are composed of 5 or more courses (Table 13). In general, the number of courses which make up an RMP is related to its age. Programs created after 1980 typically consist of one course, those founded before 1960 of three (Table 14). Many an RMP no doubt evolved from a complex of support services to a single course; in time, this course was seen to cover or to leave out so much material that additional courses seemed necessary. In a related trend, older RMP's have, in general, enrollments many times the size of the johnny-come-latelies (Table A7).

In our survey, the median RMP enrollment is 125; however, some of the programs (12%) are substantially larger, with enrollments exceeding a thousand (Table A8). Not surprisingly, most of these programs are housed in public two-year colleges (Table 15), which tend to admit the least prepared students. Thus about half (48%) of responding public two-year institutions report that at least 50% of their students are in need of remedial math courses, in contrast to only 21% of private four-year colleges.

Many remedial programs consume considerable resources including staffing, space, and equipment. Most colleges offer expensive support services for their RMP's (e.g., tutoring, CAI, etc.), particularly if a large proportion of freshmen are involved (Tables A9 and A10). On the other hand, sometimes the resources provided an RMP are inadequate; roughly 1/8 of our respondents reported that they usually offer an insufficient number of RMP sections to accommodate student demand (Table A11). This is particularly a bind when placement is mandatory. It is ironic that shortages are most common at public institutions, where the commitment of resources to remediation, while perhaps greatest, may still not meet the huge demand.

In assessing the magnitude of the challenge which RMP's address, it is sobering to note that nationally, colleges judge more than one out of every three freshmen to be in need of RMP courses (Table A12). Furthermore, student mathematical deficiencies are particularly common on some campuses: at a third of our responding colleges, more than half the freshmen are judged in need. While those colleges in which the demand for math remediation is greatest tend, not surprisingly, to be public or two-year, even in private four-year institutions, more than 1/5 of the students are characterized as underprepared (Table A13).

On what grounds is this characterization of mathematical deficiency made? Colleges generally place their students into RMP's on the basis of one or more measures of mathematical proficiency (Tables 16 and A14). By far the most common tack is to interpret scores on tests which have been administered to incoming freshmen (92%). This trend clearly reflects the recognition that tests have such advantages as timeliness, practicability, and uniformity over other placement measures. The particular instrument employed varies -- some colleges use a locally developed test (53%), some administer a commercially distributed placement test (31%), and others rely on a general college admissions test doing double duty (44%).

Table 13

Percent of RMP's Made Up of Various Numbers of Courses

(n=537)

Number of Courses	
1	38%
2	27%
3	20%
4	7%
5	4%
6	3%
7+	2%
Total	100%

Median=2

Table 14

Median Number of Courses in RMP's by the Year That the RMP Began

The Year the RMP Began	Median
Before 1960 (n=13)	3
1960-1964 (n=27)	3
1965-1969 (n=61)	3
1970-1974 (n=112)	2
1975-1979 (n=149)	1
1980 and Later (n=77)	1
Total (n=537)	2

Table 15

Percent of RMP's with Large Enrollments (1000 or More) by Type of Institution

(n=518)

Public 2-year	63%
Private 2-year	0%
Public 4-year	34%
Private 4-year	3%
Total	100%

$P(X^2)=.00$

Table 16

Percent of Institutions with RMP's Which Use Various Types of Placement Information

(n=549)

Type of Placement Information		
High School Record		48%
Test		92%
Admissions Test	44%	
Local Placement Test	53%	
Commercial Placement Test	31%	
Other		13%

The use of one placement measure in no way excludes the use of another (Lewenthal 1981). In fact, colleges typically employ more than one measure in developing a student's placement profile (Table A15).

Aside from the aforementioned tests, many colleges (48%) use high school records in defining a student's remedial status. Other types of placement information used by a small number of respondents are: the student's self-evaluation or pleasure, a statewide test, interviews, a reading test(!), the results of a summer program, and instructor recommendations.

The issue of whether a college should require its mathematically unprepared students to take remedial courses is a complex one involving the college's attitude towards its students, curriculum, and resources. At 41% of responding institutions (Tables 17 and A16), all students judged to be mathematically unprepared are clearly mandated to take RMP courses. Elsewhere, mandatory placement is less clear cut, varying with such factors as the student's major, the RMP course or the degree of student unpreparedness. Overwhelmingly (96%), institutions with mandatory placement assign students to courses on the basis of tests -- indicating a preference for uniform, objective criteria. Mandatory placement may reflect less a distrust of student judgment than a sense of institutional commitment to the RMP.

The importance of something as mundane as recordkeeping -- keeping an accurate and permanent record of each student's remedial status -- should not be overlooked, either for RMP placement or for RMP evaluation. Overall, about 3/4 of our respondents reported that they keep a record of which RMP courses students are required (or recommended) to take (Table A17). However, where tests are not used for placement, keeping a record becomes atypical (Table A18). The proportion of institutions maintaining records is, not surprisingly, high (90%) when placement into RMP courses is mandatory (Table A19).

Just how all the characteristics of the RMP's and their colleges may affect t..eir evaluative efforts is far from obvious. This issue will be addressed in the following chapter, which begins with an analysis of which colleges evaluate their programs.

Table 17

Percent of RMP's in Which Placement Is Mandatory

(n=553)

Is Placement Mandatory?	
Yes	41%
No	37%
It Depends on the RMP Course	6%
It Depends on the Student's Major	22%
It Depends on the Student's Preparation	13%
Other	7%

RMP EVALUATIONS

Colleges Which Evaluate Their RMP's

Nearly half (49%) of our responding institutions with remedial math programs indicated that their programs had been evaluated (Table A20). By contrast, a national survey conducted a decade ago (Baldwin et al. 1975) reported that only 14% of responding institutions had ever had their RMP's "formally" evaluated. While the difference between the two figures may stem in part from sample error or from variations in the wording of questions, it seems likely that the more than tripling of the rate of reported RMP evaluation is due, at least in part, to increased interest and activity in program evaluation.

Which colleges evaluated their RMP's? In an effort to address this question, we considered a number of (1) institutional characteristics, (2) RMP characteristics and (3) RMP practices, and whether these parameters are related to the tendency to evaluate. The first category included such institutional variables as type, size, and college-level math requirement, while the second included RMP goals, size, and age. In the third category, we examined such practices as whether tests are used for placement, whether placement is mandatory, whether there is an adequate number of sections, and whether student records are maintained.

An analysis of the more than 500 programs in our sample discloses that most of the variables which we considered are not related to the decision to evaluate (Tables A20, A21, A22 and A23). It is mainly the placement practices which impinge on the likelihood that a program will be evaluated. These practices are: the use of testing for placement, mandatory placement, and the maintenance of placement records. In fact, of the institutions which follow all three practices, the rate of evaluation rises to 65%.

About half of the institutions which use tests for placement in RMP courses have evaluated their RMP's (52%) in contrast to 22% of those not using tests (Table A24). Institutions at which placement into RMP courses is mandatory are almost twice as likely to have evaluated their RMP's (63%) as those at which placement into the courses is optional (35%) (Table A25). In addition, institutions which keep a student record of required or recommended RMP courses are more than twice as likely to have evaluated their RMP's (59%) as institutions which do not keep such records (23%) (Table A26).

Why should colleges which impose and keep a record of test-based student placements tend to evaluate their RMP's? There are several possible explanations. For one thing, where placement is mandatory, colleges will probably have more at stake in their RMP's, and so may be particularly anxious to determine and improve their effectiveness. Another factor is that the availability of placement (pretest) scores makes it relatively easy to measure the growth of student achievement for purposes of program evaluation, with minimal disruption to normal practice. Finally, the college's decision to allocate sufficient resources to test incoming students, to develop recordkeeping systems for storing RMP placement data, and to create mechanisms at registration or elsewhere to

enforce the RMP assignment may reflect a high degree of institutional commitment to the basic skills effort. The RMP evaluation is simply another aspect of that commitment.

We also found that institutions at which all students are required to take college-level math courses are much more likely (57%) to have evaluated their RMP's than those at which no students have such a requirement (20%). However, the small number of institutions in the second category makes it difficult to establish a statistically significant relationship (Table A27).

Description of the Evaluations

In this section we get to the heart of our investigation -- a description of the more than 200 RMP evaluations carried out in the responding colleges. Contrary to what we expected with the current emphasis on accountability, the evaluations which institutions described as their "most thorough effort conducted to date" tended to be internal projects. Less than half of the evaluations (40%) were carried out as the result of requests from outside the program (Table 18). Moreover, about two thirds of these "outside" requests still originated from within the institutions -- 41% were from the department and an additional 25% from the administration (Table 18). Furthermore, the vast majority of the evaluations (86%) were conducted without the benefit of special funds allocated for the purpose. At those fortunate institutions for which funds were allocated (16%), the most common sources of funding were the administration (46%) and governmental units and agencies (37%) (Table 19). Finally, less than 10% of the institutions used an outside evaluator (Table 20). The low reliance on external evaluators is very likely a result of the lack of funds being allocated for the evaluation, if not a fear of too critical an assessment. Because so few institutions relied on external evaluators, there is little point in our comparing evaluations conducted internally with those conducted by an outside evaluator.

Although the evaluations tended to be internal, this does not necessarily imply that they were modest in scope. While some 60% only used one approach (Table A28) and a similar proportion used only one type of student comparison (Table A29), the typical evaluation addressed several distinct questions (Table A30) and involved several kinds of data (Table A31).

Many options confront the RMP evaluator in considering how to evaluate a program. For example, in choosing an overall approach, the evaluator may focus on hard empirical student achievement data. employing the tools of statistical analysis; or instead rely on the judgment and experience of knowledgeable persons reacting to the current state of the program. Other approaches are, of course, possible. The most common approach for evaluating RMP's among our respondents was to examine the effects of the program on student performance -- these effects were examined by 88% of all evaluating institutions and 80% of those using only one approach. By contrast, about half of all of the evaluations (and less than 20% of the institutions which used only one approach) were process-oriented, focusing on an examination of RMP policies and practices (Tables 21 and A32).

Table 18

Percent of Evaluating Institutions at Which the Evaluation Was the Result of an Outside Request

(n=267)

Yes	40%
No	60%
Total	100%

If Yes, the Source of the Request

(n=96)

Department	41%
Administration	25%
Governmental Unit	19%
Private External Agency	0%
Other	16%
Total	100%

Table 19

Percent of Evaluating Institutions at Which Funds Were Allocated for the Evaluation

(n=270)

Yes	16%
No	84%
Total	100%

If Yes, the Source of the Funding

(n=41)

Department	7%
Administration	46%
Governmental Unit	37%
Private External Agency	5%
Other	5%
Total	100%

Table 20

Percent of Evaluating Institutions Which Used an Outside Evaluator

(n=272)

Yes	9%
No	92%
Total	100%

Table 21

Percent of Evaluating Institutions Which Followed Various Approaches in the Evaluation

(n=254)

Approach Followed	
Examination of Policies and Practices Followed in the RMP	51%
Analysis of the Effects of the RMP on Student Performance	88%
Other	2%

An evaluation can address any number of questions -- program effectiveness, program modification, placement effectiveness, cost-effectiveness, and so forth. While most of our evaluating institutions considered more than one question in the evaluation of their RMP's, certain questions and patterns of questions were commonly taken up. More than nine out of ten of the evaluating institutions (94%) addressed the question of the effectiveness of RMP courses (Tables 22 and A33). In fact, over three-fourths of the evaluations dealing with only one question focused on this issue. The effectiveness of the system for placement into RMP courses was the next most common concern -- 74% of the evaluating institutions and 19% of those addressing a single question focused their evaluation on this issue. Following these questions in importance were the appropriateness of the RMP curriculum (59%) and directions in which the RMP should be modified (56%). A few respondents concentrated on somewhat narrower concerns such as: the quality of RMP pedagogy, the qualifications of RMP faculty, the effectiveness of RMP textbooks, and whether the program actually operates as it is supposed to.

Whether the evaluation was conducted as the result of an outside request seems to have influenced the selection of questions which the evaluation addressed. There was a tendency for evaluators acting without an external impulse to be more interested in improving the program -- in formative evaluation; institutions at which there was no outside request for the evaluation were more likely (62%) to address the question of RMP modification than those at which there was an external impulse (46%) (Table A34). On the other hand, those evaluators with an external impulse tended to be more interested in summative evaluation -- in assessing the overall worth of the program.

The reported evaluations usually involved more than one kind of information -- only 3% relied on a single kind. Not surprisingly, certain types of data were used more frequently than others. In particular, measures of student performance -- RMP grades (81%), test scores (73%) and subsequent math grades (72%) -- were commonly employed (Table 23). One explanation for the heavy use of these types of data is the importance which is normally attached to them in student (as opposed to program) evaluation. On the other hand, the heavy reliance on these measures may reflect the relative ease with which they are collected rather than a particular belief in their importance. Following these types of information in frequency of use were: student opinions of the RMP (49%), college retention rates (44%), and RMP faculty opinions of the program (41%). Other types of information were employed much less frequently.

On the whole, the tendency to use a particular kind of information was not influenced by whether the evaluation was conducted as a result of an outside request, or whether funds were allocated for the purpose. There are, however, some notable exceptions. For example, RMP faculty opinions of the program were more likely to come up in an evaluation when there was an outside request (49%) than when there was not (36%) (Table A35). Perhaps RMP coordinators who conduct evaluations as a result of an outside request tend to fear the exposure of weaknesses and therefore rely on internal perceptions to bolster the strength of the

Table 22

Percent of Evaluating Institutions at Which the Evaluation Addressed Various Questions

(n=263)

Question Addressed	
Are the Courses Effective?	94%
Is the Placement System Effective?	74%
Is the Curriculum Appropriate?	59%
Is the RMP Cost-effective?	27%
How Should the RMP Be Modified?	56%
Other	3%

Table 23

Percent of Evaluating Institutions Which Used Various Kinds of Information in the Evaluation

(n=267)

Kinds of Information Used	
Grades, Passing Rates, etc. in Remedial Math Courses	81%
Test Scores	73%
Grades, Passing Rates, etc. in Subsequent Math Courses	72%
Student Opinions of the RMP	49%
College Retention Rates	44%
RMP Faculty Opinions of the Program	41%
Student Attitudes Toward Math	27%
Grades, Passing Rates, etc. in Subsequent Science/Technical Courses	17%
Non-RMP Faculty Opinions of the Program	17%
College Graduation Rates	13%
Judgment of Visiting Experts	8%
Other	3%

program. Not surprisingly -- given the cost of employing consultants -- those institutions at which funds were allocated for the evaluation were more likely to rely on the judgment of visiting experts (29%) than were institutions at which funds were not allocated (4%) (Table A36).

A comparison of RMP students before and after the RMP -- the pretest-posttest design -- was the design most commonly used in the evaluations (58%), followed by a comparison of students completing the RMP with those who were exempted (40%), a comparison of students completing the RMP with students needing but not taking it (24%), and a comparision of recent RMP completers of recent RMP completers with previous completers (Table 24). It is likely that colleges relied on these designs because of the relative ease of their implementation -- particularly the first -- in contrast to more difficult designs such as a comparison of local results with those at other colleges (3%). The significance of the three most popular designs is confirmed by the high proportion of evaluating institutions using a single comparison in their evaluation that used each -- 61%, 22% and 10% respectively (Table A37). Very few colleges (7%) employed a design involving a comparison with a national norm -- quite a different result from what one would get in the evaluation of reading programs, for example, where national standardized tests for placement are more common.

In short, we found that the typical evaluation was conducted internally, without special funding, and was based on data which were more or less readily available. However, this description only tells part of the story. We went a step further and investigated the relationships among various components of the evaluation -- the questions addressed, the approaches taken, the types of information employed, and the comparisons drawn. The resulting statistics are presented in Tables A38 through A43. While some of the relationships are puzzling and in fact may only be statistical flukes, others are quite understandable.

Among the latter is the following relationship: evaluations considering placement effectiveness were much more likely to compare students who completed the RMP with exempted students than those which did not consider placement effectiveness (45% vs. 24%) -- clearly a strategy for investigating cut scores. Not surprisingly, institutions which examined the effects of the RMP on student performance tended to rely heavily on such measures of achievement as test scores (77% vs. 42%), RMP grades (84% vs. 68%), grades in subsequent math courses (78% vs. 32%), and retention rates (48% vs. 19%). By contrast, those which examined policies and practices of the RMP were significantly more likely to use student opinions of the RMP (63% vs. 33%), student attitudes toward math (40% vs. 15%), opinions of RMP faculty (56% vs. 28%), and the judgment of visiting experts (13% vs. 2%). Comparisons of students before and after the RMP were more likely to use test scores than those evaluations eschewing this comparison (85% vs. 61%), no doubt because other measures of achievement are often not available for students prior to remediation. Also, institutions which compared students completing the

Table 24

Percent of Evaluating Institutions Which Used Various Comparisons in the Evaluation

(n=245)

Comparison Used	
Students Before and After RMP	58%
Students Completing RMP vs. Exempted Students	40%
Students Completing RMP vs. Students Needing But Not Taking	24%
Recent RMP Completers vs. Previous RMP Completers	10%
Local RMP Completers vs. a National Population	7%
Local RMP Completers vs. RMP Completers at Another College	3%
Other	3%
No Comparisons Were Made	17%

RMP with exempted students were more likely (85% vs. 69%) to rely on test scores (perhaps surprisingly), and also tended to use grades and passing rates in subsequent math courses (91% vs. 64%) -- measures readily available for the exempted population. Probably for a similar reason, evaluations involving a comparison of students completing the RMP with those needing but not taking remedial math courses tended to rely on grades in subsequent math (86% vs. 71%) and science/technical courses (31% vs. 13%).

We also investigated whether the nature of a college's evaluative activities was related in any way to specific characteristics of the RMP. Here we were less successful in teasing out patterns, although a couple of interesting, if tentative, relationships did emerge. We found that the oldest RMP's were much more likely to adopt a historical perspective -- to compare recent RMP completers with previous completers in their evaluations (Table A44). Also, colleges with an insufficient number of RMP sections to meet student demand were more likely to compare students completing the RMP with students needing but not taking remedial math courses, no doubt a reflection of their strategy to create a control group of "leftover" students without withholding remediation from students and exposing the evaluator to the charge of callousness (Table A45). However, in neither case was the relationship statistically significant, if only because of a skewed sample.

Of course, the circumstances under which many of these evaluations were conducted may have been far from ideal, resulting in compromised designs or implementation. In some cases, decisions were no doubt made, if not forced, as a result of circumstances beyond the control of the evaluator. Therefore before drawing any conclusions about past evaluation trends, and prior to making any suggestions for future RMP evaluative work, we will turn our attention to the comments of our several hundred respondents who have gone through the evaluation process, to gain insight into what problems they faced, what results they achieved, and how they perceived the experience.

AFTER THE EVALUATION: REACTIONS AND CONSEQUENCES

Before making the commitment to evaluate a remedial mathematics program, one should be convinced that the job of planning and carrying out an evaluation is worth the effort. An informal evaluation of a small, single-course RMP may only entail minimal effort; however, a comprehensive, longitudinal study of a multi-course, multi-campus program can be a huge undertaking. The experience of our respondents -- the extent to which they were satisfied with their evaluations, the problems they encountered, the results the evaluations produced, and any advice which they would give to someone about to design or conduct an RMP evaluation -- can provide us with some insight into the value and cost of the evaluation process.

Satisfaction and Problems

When asked whether they were satisfied with the most thorough evaluation conducted on their RMP to date, the majority of our respondents answered our closed-ended question in the affirmative: yes, they were satisfied both in terms of design and conduct (Tables 25, 26 and A46). On the other hand, evaluations in which no comparison of student outcomes was employed generally led to dissatisfaction. Respondents from institutions using an outside evaluator were more likely to be satisfied with the evaluation design and conduct than those without outside evaluators, however the differences are not statistically significant. In their open-ended comments, a majority of respondents indicated some reservations about the evaluation, suggesting that the typical respondent was generally but not completely satisfied with the evaluation.

The most frequently voiced criticisms dealt with deficiencies of data employed in the evaluation. In the typical criticism, the data were characterized as subjective or superficial (Tables 27 and 28). A related objection was the lack of longitudinal or follow-up information, either in courses immediately following the RMP or in courses through to graduation. Obtaining such information requires a longer commitment than some evaluators were perhaps able or willing to make. Several respondents noted with disapproval the lack of other kinds of data as well -- opinions from outside the department, multiple measures of achievement, etc.

Another concern was the problem of access to or availability of data. Some criticisms dealt with information which was lost or never obtained. This information was of many types, including posttest scores of students who dropped out of the program or college, or who were never in the RMP; various kinds of data for which a satisfactory recordkeeping system had not been developed; or measures of post-RMP achievement for students who did not advance to a college-level math course immediately upon exiting from the program. Other criticisms related to the denial of access to data by instructors, departments or the administration. In short, underlying problems seemed to be poor planning, lack of cooperation, lack of resources, or logistical difficulties.

Table 25

Percent of Evaluating Institutions Satisfied with the Evaluation Design

(n=245)

Satisfied?	
Yes	74%
No	27%
Total	100%

Table 26

Percent of Evaluating Institutions Satisfied with the Conduct of the Evaluation

(n=242)

Satisfied?	
Yes	81%
No	19%
Total	100%

Table 27

Percent of Evaluating Institutions with Various Reactions to the Evaluation Design

(n=63)

Reaction	
Too Superficial	33%
Additional Data Needed	29%
In Progress	14%
Generally Adequate	13%
Design Problems	11%
Inadequate Resources	8%

Table 28

Percent of Evaluating Institutions with Various Reactions to the Conduct of the Evaluation

(n=34)

Reaction	
Too Superficial	29%
Additional Data Needed	21%
Generally Adequate	18%

Poor cooperation from various segments of the college community was cited in connection with a number of other difficulties. One respondent noted that some course instructors disliked the evaluation because they considered it to be an evaluation of their performance. Several others pointed to indifference or hostility from the Remediation Center, non-RMP faculty or the administration.

Many of the respondents pinpointed particular design or measurement problems -- problems no doubt related to the concern expressed earlier about the quality or quantity of evaluative data. Half a dozen respondents indicated that comparisons such as those described in the survey questionnaire should have been but were not made. A particular design complaint was the lack of a control group with which to compare the RMP "graduates," a failing noted frequently in the literature (e.g., Piesco 1978). One important observation was that the success of students in RMP courses depends on a large number of variables, making it difficult to identify causal relationships. Several respondents expressed disapproval of the tests used to obtain data. A number of individuals, while admitting deficiencies in their evaluation, attempted to absolve themselves of any liability, blaming instead the governmental agency or external unit which imposed on them design or time constraints.

Another object of criticism was the nature or size of the student sample on which the evaluative study was based. Some respondents complained that the sample employed was either too small or not sufficiently representative of the larger student population for the study to yield generalizable results. The basic problem here was probably a decision to be expedient in choosing to work with students on whom data were most easily obtained; a lack of resources to handle larger quantities of data may also have contributed to the difficulty.

As to the particular problems which were encountered in conducting the evaluation, one of the most common was inadequate resources (Table 29). The insufficiency of many different kinds of resources was cited, including funding, time, released time, staffing, computer support, secretarial help, technical expertise and general support.

Some respondents had an unkind word for the individual or individuals responsible for the evaluation. One argued generally against outside evaluators: "People from outside the RMP program have very little understanding of the total program, but they were in charge of the evaluation." Another wrote of the poor communication between the evaluators and the faculty involved in the RMP.

Finally, there were a number of technical and logistical problems singled out as affecting the evaluation. These were quite varied, and included: the short life of the program, getting placement tests given to students before they enter class, coordinating the administration of tests on two campuses, and computer keypunching.

With all the obstacles which RMP evaluators seem to have faced, it's easy to forget that overwhelmingly, respondents reported being satisfied

Table 29

Percent of Evaluating Institutions Encountering Various Problems in the Evaluation

(n=92)

Problem	
None	25%
Inadequate Resources	19%
Inadequate Data	15%
Lack of Support	10%
Inadequate Access to Data	8%
Design Problems	6%
Technical/Logistical Problems	5%

with their RMP evaluations. One of the reasons for this satisfaction may be the program improvements to which the evaluations led -- a subject to which we now turn.

Recommendations and Changes

If RMP evaluations tend simply to "rubber stamp" dominant program practices or to suggest program changes which never get implemented, then the value of even the most minimal effort expended in the evaluation process would be questionable. However, the experience of our respondents indicates that neither of these depressing scenarios is typical. More often than not, thorough evaluations do include suggestions for modifying the RMP in one way or another, and these modifications generally seem to be implemented (Tables A47 and A48). In a phrase, evaluations can make a difference.

The great variety of recommendations from their evaluative studies which our respondents reported reminds us of the large number of threads which are entwined in a remedial mathematics program. Untangling these threads and selecting directions for program change can challenge any RMP evaluator or administrator. That recommendations from different institutions are frequently at cross purposes with one another should not be seen as evidence of their invalidity. Rather this Brownian motion with its apparently random variation reflects the way in which educational research differs from educational evaluation. In research, the investigator attempts to identify educationally significant principles which hold in the broadest range of possible settings. An evaluation, however, focuses on a particular program in a particular institution with a particular mission, particular resources, and particular constraints at a given point in time. No wonder then that at different institutions, evaluations lead to conflicting recommendations.

Table 30 summarizes the changes in RMP's most frequently recommended in program evaluations, while Table 31 shows the changes actually implemented as a result of evaluations. It is clear from these tables that in more than half the cases, recommendations in evaluative studies led to program change.

More recommendations dealt with placement procedure than any other area. The suggested placement changes were of many types. Quite a few advocated changing the placement exam, often by developing an in-house exam. Other recommendations had to do with adjusting cut scores on the placement exam, and, in one case, changing the length of the exam. A number of evaluations proposed that the placement exam be administered to broader categories of students. Several comments dealt with moving toward mandatory placement into RMP courses, while one advocated moving in the opposite direction toward voluntary enrollment, and still others with the imposition of a college-wide competency standard.

Some recommendations involved suggested changes in RMP pedagogy, often a shift from self-paced instruction toward the more structured, conventional group-paced instruction. From our small sample of comments, there is the suggestion that whatever the advantages of

Table 30

Percent of Evaluating Institutions with Various Recommended Changes Resulting from the Evaluation

(n=117)

Recommended Change	
Change Placement Criteria	23%
Change Instructional Method	13%
Redesign Course(s)	12%
Change Course Content	10%
Change Exit Criteria	8%
Create Math Lab	6%
Change Course Sequence	5%
Add Courses	4%
Separate Courses	3%
Combine Courses	2%

Table 31

Percent of Evaluating Institutions with Various Changes Implemented as a Result of the Evaluation

(n=117)

Implemented Change	
Change Instructional Method	16%
Change Placement Criteria	16%
Change Course Content	12%
Redesign Course	11%
Change Exit Criteria	8%
Change Curricular Materials	7%
Separate Courses	5%

self-paced instruction, the associated disadvantages -- procrastination, special staffing, grading and registration procedures among them -- are increasingly being viewed as carrying greater weight.

Many evaluations contained proposals for modifying RMP goals, curricula or courses. Typical were recommendations to clarify or change course objectives in the light of new circumstances; to add or take away courses in arithmetic, algebra, trigonometry or plane geometry; and in one way or another to extend, re-order or re-organize course topics. Some suggestions had to do with changing the RMP course structure, sometimes by modularization, other times by altering the course sequence or by merging separating courses. Other suggestions dealt with the addition of courses for special student populations (e.g., students who only need a brief review).

A number of recommendations advocated redesigning courses in special ways -- making them more practical and less theoretical, upgrading the content, integrating remedial and non-remedial content in a new course, creating two-week workshops at the end of the semester for students who did not pass the posttest, increasing the number of contact hours which RMP courses meet, or changing the schedule of RMP courses in one way or another.

Some suggested changes focused on improving support services. Typical among them were recommendations that more tutoring be provided; that the amount of lab facilities be increased; that computer-assisted instruction be offered; that a Math Lab be established, dropped or restructured; and that a student assistant for each class be provided. Several recommendations supported changing the textbook or seeking a text with prescribed features.

Many respondents reported recommendations concerning RMP exit criteria, grading practices, or the granting of credit for RMP courses. A common recommendation was to upgrade the content in RMP courses and also to raise the standards for successful completion. Representative comments were: "Stop offering remedial math (disguised as business math) for college-credit," and "No longer allow basic algebra to meet a graduation requirement in general education. (However, still let it count towards the 124 hours required for graduation.)" A related recommendation was to standardize exit criteria -- particularly when many sections of a course are taught by adjunct faculty. Other proposals supported changing the grading system to pass/fail (S/U), or modifying policy concerning the granting of the grade of incomplete -- often a controversial issue under self-pacing.

Some suggestions had to do with teaching and testing strategies, as well as with student-teacher relations. Several recommended that the RMP courses provide additional practice in solving exercises of a practical nature. Several of the recommendations on testing supported the adoption or discontinuation of mastery testing (retesting-until-mastery). Others called for improving communication between students and faculty by holding conferences regularly, or by having faculty periodically write follow-up letters and make telephone calls to students. Specific

pedagogical recommendations included placing more emphasis on explaining the meaning of new mathematical terms -- especially pertinent to students who are weak in reading or study skills -- and having each student set his or her own course goals.

Organization, attendance, recordkeeping, funding and location were dealt with in a number of recommended changes. Several involved taking the RMP out of the mathematics department -- its traditional home -- and moving it to another administrative unit within or even outside the college. Other administrative recommendations included restricting attendance -- a measure sometimes adopted when programs have low passing rates -- computerizing RMP student recordkeeping, and moving RMP classes to the Learning Center. Still others related to improving the program's cost-effectiveness; one idea here was to "replace the state-funded remedial algebra course with a student-funded workshop."

Some proposals advocated changes in RMP staffing, staff development and resources. Several dealt with establishing procedures for training teaching assistants, tutors or other support staff, sometimes through workshops. One idea was to require first-semester instructors to attend weekly seminars. Other recommendations were to change a particular instructor, hire additional staff, offer more sections, or reduce average class size.

Only one respondent reported an evaluation which explicitly recommended that his or her RMP be continued. The absence of this particular recommendation from other evaluations is quite striking. This absence not only suggests that the continuation of RMP's seems to be almost universally taken for granted, but also that the underlying goals of RMP evaluation are as much formative (how can we improve the program?) as they are summative (how good is the program?). This pattern has important implications for RMP evaluation design, a theme to which we shall turn in the concluding section of this monograph.

Advice

On our questionnaire, respondents were invited to give advice of any sort to someone about to design or conduct an RMP evaluation. The resulting comments are categorized in Table 32. They are extremely varied. In many cases, they simply voice issues which had surfaced in the earlier section of the questionnaire dealing with evaluation problems -- sufficiency of data, data comparisons, and sufficiency of resources, for example. However, these responses also raise other concerns not previously addressed in our analysis of survey results.

For one thing, quite a few respondents emphasized what should but may not be obvious -- the importance of planning ahead in an RMP evaluation. Several comments urged the would-be evaluator to consult with others who have been invoived with evaluations of the sort desired, to read the professional literature for design alternatives, and to otherwise "do your homework." One of many reasons for planning an evaluation ahead is to avoid losing irretrievable data, such as pretest scores and attitudinal measures prior to remediation. One piece of advice

Table 32

Percent of Evaluating Institutions Giving Various Types of Advice on the Design or Conduct of an RMP Evaluation

(n=83)

Advice	
General Advice	20%
Importance of Using an Outside Evaluator	13%
Importance of Identifying the Program Needs	10%
Advice on Statistical Analysis and Design	9%
Importance of Getting Faculty and Administrative Support	8%
Importance of Seeking Certain Characteristics in the Evaluator	7%
Importance of Looking at Passing Rates in Non-remedial Courses	6%

urged colleges to design the RMP with evaluation in mind, institutionalizing pre- and posttests, questionnaires, etc., in order to conduct program evaluations on a regular basis with minimal disruption to normal practice.

Some of the suggestions dealt with the results and recommendations which the final evaluation report should contain, and how they ought to be arrived at. One respondent cautioned against jumping to conclusions before the analysis is completed. A second advised the evaluator to "be prepared for depressing results," a caution which might better have focused on the avoidance of unreasonable expectations. A third, apparently well trained by his college's administration, wrote: "Regardless of the conclusions drawn at the end of the evaluation, don't (!!) recommend more resources, personnel or money -- any changes recommended should use existing personnel resources and money." Another respondent emphasized the importance of keeping the final evaluation report simple and clear in order to reduce the chances that it winds up dustladen on an administrator's shelf.

A number of respondents expressed their views on who should conduct an RMP evaluation. Suggestions included: a respected member of the mathematics department, faculty who teach RMP courses, faculty who teach college-level math and science courses, and research-oriented mathematicians. Many respondents suggested that outside evaluators be employed to conduct the evaluation, presumably because of their perceived or actual impartiality, their commitment to carry out the project, and their technical and statistical expertise. One person noted that whoever designed the evaluation, it was imperative that "someone carry it through to the end."

Some advice urged the clarification or specification of RMP goals and needs. Typical was: "Clearly identify and state course objectives, then evaluate with respect to the specified objectives" -- a point of view which would be opposed by evaluators preferring goal-free assessment. One respondent wrote of the importance of RMP and non-RMP math courses having goals which articulate; another, disdainful of affective considerations, felt that "the only meaningful criterion is the success of students in achieving academic goals."

A number of respondents argued for drawing various comparisons in the evaluation -- one of the issues at the heart of any evaluation. Some of the designs advocated were the pretest-posttest comparison and the cross-college comparison, that is, comparing the effectiveness of the local RMP with that of an RMP at a comparable college. One respondent wrote of the importance in evaluation of controlling such variables as teacher, time of day, and student background differences. Several respondents asked for, rather than gave, advice on the question of evaluative comparisons, such as "I wish I knew how to design an evaluation so that I could offer some constructive suggestions."

Some advice dealt with securing different kinds or sufficient quantities of data for the RMP evaluation. Most common were comments stressing the importance of longitudinal data. Typical was: "Be sure to include a follow-up on students after they exit from the RMP -- how do

they do in subsequent math courses," or again, "Our main concern is what happens in subsequent courses (we found that only students who make A's in remedial courses are good risks for regular math courses)." Some of the other suggestions were to gather multiple measures of achievement in order to have a well-rounded assessment. One respondent noted the importance of being careful to consider the background of RMP students when comparing them with others. The value of accurate recordkeeping was emphasized in several comments, both in RMP and post-RMP courses.

A number of respondents commented on tests and other instruments for gathering data for the evaluation. The most common advice was to employ a standardized test in the evaluation. One respondent gave her opinion on measuring attitudes and opinions: "Use well-planned, face-to-face interviews -- they are worth a hundred questionnaires; interviewees should be chosen at random."

Many comments were political and pragmatic, focusing on the desirability and ways of securing faculty and administrative support for the evaluation. One such comment suggested that the evaluator "explain why the evaluation is needed, how it will benefit the development of the program, and present efficient and well thought out procedures for accomplishing it." A less optimistic respondent noted: "Don't expect help from the administration or money either!"

All in all, the concerns raised by our respondents in the advice which they gave and in their comments on past evaluations suggest that the responsibility of evaluating an RMP must not be taken casually. The message is clear: unless care is exercised in avoiding a host of potential difficulties, the evaluation's payoff may be minimal. On the other hand, with sufficient attention to avoiding these difficulties -- with careful planning, a qualified evaluation team, the cooperation of colleagues and administrators, an appropriate choice of data and data comparisons, and sufficient resources of many kinds -- an RMP evaluation can be designed and carried out which can shape the future of the RMP for the better.

CONCLUSIONS AND RECOMMENDATIONS

In the course of this investigation, we have examined the responses from some 700 institutions and seen the extraordinary scope of the remediation challenge with which the postsecondary mathematics community is confronted. We have learned that the overwhelming majority of colleges, at least in our sample, offer remedial math programs and that on the average colleges with RMP's judge the algebraic or arithmetic preparation of 1 out of every 3 entering students to be inadequate. Moreover, we have seen how RMP's have grown and become firmly entrenched until today their continued existence has come to be taken for granted.

This monograph has dealt with many aspects of RMP's -- the context in which they operate, their goals, their curricula, and their enrollment patterns, to name but a few. However, our primary concern has been to document the kinds and frequency of RMP evaluations which colleges have conducted to date. To carry out this task, we have identified a number of methodological characteristics which taken together constitute an evaluation profile. Most notable among these characteristics have been: the general evaluative approach taken, the questions addressed in the evaluation, the kinds of data collected and analyzed, the types of student comparisons (designs) employed, the nature of the resources and personnel that were available for the evaluation, and finally the problems which came up in the course of implementation.

In this concluding chapter, we draw from our survey findings some suggestions for future RMP evaluation and research.

(1) We recommend that colleges periodically undertake rigorous evaluations of their RMP's.

While the notion that colleges should regularly conduct a rigorous assessment of their RMP's may seem trite, we do not make this recommendation lightly. Quite the contrary, for our survey provides evidence of serious difficulties commonly associated with RMP evaluations. However, of greater significance is the fact that the hundreds of program evaluations on which our respondents have reported more often than not led to significant improvements in RMP's -- improvements covering such pivotal program elements as placement criteria, instructional method, and course design or content. We believe that many of these changes would not have been effected, let alone considered, had the evaluative studies not been conducted, and that they constitute a tangible payoff for the time, effort, and resources invested in the evaluation.

(2) We recommend that evaluations should assess the appropriateness of the RMP curriculum, identify the program's strengths and weaknesses, and suggest improvements in the program.

Not surprisingly, the two issues most commonly addressed in the hundreds of surveyed RMP evaluations were: (i) the effectiveness of the system of placing students into RMP courses and (ii) the effectiveness of these courses. Clearly, both issues are important and should be dealt with in any study.

However, it seems of dubious value to assess placement and course effectiveness before first establishing the appropriateness of the course content. This concern for curricular validity is vital during those periods of time when program goals or circumstances are shifting significantly. We believe that technological and professional forces already at work may well contribute to such shifts in the near future. For one thing, the full curricular consequences of the calculator and the computer have yet to be felt in RMP's. Then again, various trends in college and high school curricula -- for example, greater emphasis on problem solving and the applications approach in the high school, the introduction of discrete mathematics into the college curriculum, and shifting statistics and logic downward into the high school -- make it essential that evaluative studies ascertain whether RMP curricula are meshing with both secondary and postsecondary courses.

We'd also like to advocate that future RMP studies stress formative evaluation at least as much as summative evaluation. Unlike a summative study which assesses the overall worth of a program, a formative evaluation identifies the strengths and weaknesses of a program, and recommends ways in which the program should be modified.

While RMP evaluations frequently involve the gathering of opinions on ways to improve the program from various constituencies, and some evaluation strategies have formative as well as summative value, nevertheless, the typical RMP evaluation is unquestionably designed so as to gather evidence on the overall worth of the existing program. In our opinion, RMP evaluations should also include empirical studies specifically geared toward program improvement. Such studies might investigate any of a number of important aspects of the program: whether students who repeat RMP courses or ESL students succeed as well as other students, whether tutorial or computer-assisted instruction is more effective, whether reading courses should be taken prior to or concurrent with math courses, whether arithmetic and algebra should be taught in separate courses or together, whether adding a math lab hour improves passing rates, and so forth. Exploratory investigations dealing with these and other program issues can provide valuable clues to identify desirable changes.

(3) We recommend that RMP evaluations focus on data which measure the extent to which program goals are achieved.

The primary goal of most RMP's is to prepare students to master college-level mathematics. Consequently, RMP evaluations, whether formative or summative, should focus on measures of student success in subsequent college-level math courses. However, we found that the most commonly employed type of evaluative data were not grades in follow-up courses but grades earned in the RMP itself. More than a fourth of our reported evaluations failed to include any measure of achievement in subsequent college-level math courses. This lack of longitudinal information may be the basis of the frequently voiced criticism that data employed in evaluations were superficial.

(4) We recommend that summative RMP evaluations compare the achievement in follow-up courses of students who have passed RMP courses with students who needed but did not receive remediation, and with students who were initially exempted from remediation.

As noted previously, most evaluations in our survey used one or another student comparison (design) to assess program effectiveness. Among the comparisons were: the pretest-posttest design, the norm-group design, the cross-program design, the remediated-exempted design, and the remediated-unremediated design. A striking trend emerges when we look at the frequency of designs, a trend which says as much about human nature as about program evaluation: the easier a comparison is to carry out, the more frequently it is conducted. This "Law of Expediency" explains why comparing students before and after they are in the RMP (the pretest-posttest design) is used so frequently: it is by far the simplest comparison to implement.

Unfortunately, the pretest-posttest comparison has several drawbacks, any one of which might be considered fatal (Akst and Hecht, 1980). For one thing, it nearly always yields positive results; after all, students spending several hours a week in remedial courses even under the worst of circumstances are bound to learn something and score higher at the end of the course than at the start. Secondly, if there is a gain, the design sets no standard of acceptability with regard to the size of that gain: how much is enough? Another drawback to this design is that the gains calculated by subtracting pretest from posttest scores may be only loosely related to the program's effectiveness; the gains could have resulted from learning or reviewing outside the course, from the statistical phenomenon of regression toward the mean, from students simply trying harder on the final exam than on the placement test, or from a host of other uncontrolled and confounding variables. Finally, the design ignores improved performance in follow-up math classes -- generally the program goal. In other words, it substitutes learning for retention and transfer as measures of success.

Just as the pretest-posttest design asks the question Do students know more at the end of remediation than at the beginning, so in the norm-group comparison, the issue is: How does the improvement of students in the RMP compare to the improvement of a comparable, national group of students on whom test norms have been published? The cross-program design contrasts the gains registered by students in the local RMP with those in another program; it asks the question: Which program is doing a better job with comparable students? The fact that both the norm-group and the cross-program designs were used infrequently -- for example, the cross-program design was found in only 3% of surveyed evaluations -- is almost certainly attributable to associated pragmatic difficulties. These range from finding a suitable standardized test with the right content, norm-group, price, administration time, and a sufficient number of equivalent forms, to finding comparable RMP's willing to participate in a politically sensitive experiment.

Leaving aside the weak pretest-postest design and the impractical norm-group and cross-program designs, this leaves us with two comparisons, each of which seems both valid (in the sense of generating cogent evidence) and workable. The remediated-exempted design compares students who have passed RMP courses with others who were originally exempted from these courses. The stringent question here is: Do students who have gone through the RMP subsequently perform as well as students who originally had not needed remediation? The relevance of this question to typical program goals is obvious. Finally, there is the classic control group comparison -- the remediated-unremediated design -- in which students who have gone through the program are contrasted with students who were diagnosed as needing remediation but did not enroll in RMP courses. This design asks: If students who passed remedial courses had not had the benefit of remediation, would they have turned out as well?

Neither design is as easy to implement as the pretest-posttest comparison. In carrying out the remediated-unremediated design, for example, it may be difficult to find initially comparable students outside the RMP either because of mandatory placement or because of the self-selection bias. Furthermore, both designs will somehow have to take into account another group of students, namely those who start out in the RMP but never pass. Despite such vexations, we are encouraged by the fact that significant percentages of our surveyed evaluations used one or the other of these designs, hopefully finding ways around difficulties in their implementation.

The choice of an evaluation design -- like the choice of type of data -- will have a major impact on the evaluation's results. It may "stack the deck" to a considerable extent in advance of the study's actual implementation. Thus it is essential, if an evaluation is to be more than a self-serving exercise, that the design and data combine qualities of intellectual integrity and practicability.

(5) We believe that there is a need to develop a consensus on what constitutes valid methodology in an RMP evaluation.

The 1930's were the "shaking out" period for the accounting profession in America. That decade saw a search for basic tenets which would eventually become today's Generally Accepted Accounting Principles (GAAP). A 1936 editorial in one of the leading accounting journals stated the problem:

> After a quarter of a century and more of active discussion and experimentation in this country, many of the simplest and most fundamental problems of accounting remain without an accepted solution. There is still no authoritative statement of essential principles available on which accounting records and statements may be based. Public accountants ... have been asked to certify to the correctness and adequacy of accounting statements when no satisfactory criteria of correctness and adequacy have been agreed to....What is wrong with accounting as the public sees it? Could it be the fact that there is still no broad authoritative code of accounting principles?

RMP evaluators in the 1980's confront a similar challenge. The diversity of methods employed in the name of assessment provides little confidence in their validity and may simply reflect a lack of standards. Frequently employed but questionable evaluation practices such as the use of RMP grades as measures of program success or the use of the pretest-posttest design without controlling extraneous variables have the effect of exaggerating the chances of programs taking home report cards more favorable than they deserve. Such strategies, whether adopted because of limited resources, lack of knowledge, expediency, or even self-interest, bring evaluation into disrepute. Clearly, those of us involved in RMP's and their evaluation need to develop our own "GAAP." While agreement on a single evaluation model may not be feasible if only because of significant variation in local parameters, the adoption of broad principles of RMP evaluation such as the few recommended above could be a guide for future practice, and also serve as a preemptive strike against budget-cutting state legislatures.

As a means of accomplishing this goal, the major national organizations such as AMATYC or the National Association of Developmental Educators (NADE) would do well to reach agreement on generally accepted principles in RMP evaluation, or at the least on what constitutes the key questions and concerns which should be addressed in an evaluation. Furthermore, the force of these organizations behind a statement of minimal resources for adequately evaluating a program could be helpful to future faculty evaluators. With luck, specific models for evaluation of RMP's might be identified as worthy of the imprimatur of these organizations. Another route to achieve a similar goal would be to reach a consensus at a gathering of leading program evaluators and RMP coordinators from around the nation, preferably with support from a civic-minded, private foundation or a governmental agency such as the Fund for the Improvement of Postsecondary Education (FIPSE).

(6) We recommend that RMP coordinators become familiar with the principles and practices of program evaluation.

Since less than 1 out of every 10 evaluations reported in our survey involved an outside evaluator, it is clear that college faculty and staff -- often the remedial coordinators -- are evaluating their own programs. It is up to them to wrestle with the large number of approach, design and data issues which confront any evaluator.

As we have already observed, the stand taken with respect to these issues will to a major extent determine the outcomes of the evaluation. It is critical that such decisions be based on a sound knowledge of the pros and cons of alternative evaluation strategies. To foster this understanding, we'd like to see graduate schools of education encourage prospective college math faculty -- particularly those headed for public two-year institutions -- to take courses in program evaluation. Faculty who have assumed the post of RMP coordinator most particularly need to be conversant with the RMP evaluation literature.

(7) We recommend that additional research be conducted on patterns of RMP evaluation.

Many of our findings have confirmed the hypothesis that the characteristics of both a college and its RMP help to shape its evaluative activity. To recall just one of many examples, we've learned that the likelihood of evaluating an RMP seems to be related to an institution's overall commitment to mathematics as measured by such indicators as whether the college requires all students to take a course in college-level mathematics, or all students found in need to be assigned to the appropriate RMP course.

The discovery of such relationships depends on the characteristics under investigation. Other researchers may wish to select variables different from ours and to explore connections among these new college, program and evaluation profiles. One of a number of major RMP characteristics which we have ignored is the mode of instruction dominant in the program; a hypothesis which we believe worth testing is that RMP's with unconventional instructional practices are most likely to be evaluated, or to be evaluated in some special way. In addition, an interesting evaluative trait which we might have included on the questionnaire had space permitted is whether the RMP assessment was based on a value-added or a mastery-learning philosophy. That is, was program success measured by the number of students completing RMP courses whose achievement increased by a certain amount or by the number of these students who attained a pre-specified level of competency? Such distinctions in the groundrules of a study can radically alter findings.

Many other questions related to RMP evaluation need to be explored. For instance, what designs and data are being used to assess the efficacy of placement procedures? And what of the cost-effectiveness of RMP's -- what kinds of evidence are being gathered to determine if colleges get more out of their programs than they put in, in terms of cold, financial investment?

There is no lack of questions of both practical and theoretical interest beckoning to future researchers.

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The City University of New York
Instructional Resource Center
Office of Academic Affairs

AMATYC
American Mathematical Association
of Two Year Colleges

April 22, 1983

Dear Colleague:

In recent years, the effectiveness of basic mathematics skills programs has been assessed in a number of ways. In an attempt to distill from this collective experience some guidelines for future program evaluations, the Instructional Resource Center of the City University of New York and the American Mathematical Association of Two Year Colleges are jointly sponsoring a survey of approaches used to evaluate remedial mathematics programs.

We are requesting that you either fill out this questionnaire or forward it to the appropriate individual on your campus, stressing the importance of the project. The questionnaire should be returned to us as soon as possible.

We would like to assure you of the confidentiality of the information you provide us. The results of the survey will be presented in the aggregate only; no single institution will be mentioned either by name or identifying data. All respondents will be sent a copy of the completed report.

Thank you for your participation in this important project.

Cordially,

Geoffrey Akst
Chair, Evaluation Subcommittee
of the Developmental Mathematics
Curriculum Committee, AMATYC

Marie Jean Lederman
University Dean, Academic Affairs
Director, Instructional Resource Center, CUNY

[1-6]

A Questionnaire on the Evaluation of Remedial Mathematics Programs

This questionnaire is designed to gather information about the evaluation of remedial mathematics programs. For purposes of this questionnaire, one or more remedial mathematics courses constitute a remedial mathematics program (RMP). Throughout, the term evaluation refers to a wide range of informal or formal program review and assessment activities. Please answer the questions below by filling in the blanks, or where indicated, by placing a check mark beside the appropriate answer. Please ignore the italicized numbers; they are for processing responses. Thank you for your cooperation in completing the questionnaire and returning it as soon as possible.

Part I. College Characteristics

[7] 1. Type of Institution:
- 1 ☐ Public two-year college
- 2 ☐ Private two-year college
- 3 ☐ Public four-year college
- 4 ☐ Private four-year college
- 5 ☐ Other (please specify) _____

[8-12] 2. Approximately how many undergraduate students attend your college? _____

[13-16] 3. Approximately how many freshmen enter your college each fall? _____

[17] 4. Are students at your college required to take one or more *college-level* mathematics courses to graduate?
- 1 ☐ All students are required to take one or more college-level mathematics courses.
- 2 ☐ Students in certain majors are required to take one or more college-level mathematics courses.
- 3 ☐ All students must meet distribution requirements toward which college-level mathematics courses count.
- 4 ☐ Students in certain majors must meet distribution requirements toward which college-level mathematics courses count.
- 5 ☐ No students are required to take college-level mathematics courses.
- 6 ☐ Other (please specify) _____

[18-19] _____

[20] 5. Does your college offer any remedial mathematics courses?
1 ☐ Yes 2 ☐ No

If the answer to Question 5 is yes, please proceed to Part II; otherwise proceed to Part IV.

Part II. Characteristics of Your Remedial Mathematics Program

[21-22] 6. In what year did your RMP begin? _____

7. Which of the following are the major goals of your RMP? (check all that apply)
- [23] ☐ To prepare students for subsequent mathematics courses
- [24] ☐ To prepare students for subsequent science/technical courses
- [25] ☐ To prepare students to meet a college, university, or system-wide standard of competency
- [26-27] ☐ Other (please specify) _____

8. Which areas of mathematics are covered in the RMP courses at your college? (check all that apply)
- [28] ☐ Arithmetic
- [29] ☐ Elementary Algebra
- [30] ☐ Intermediate Algebra
- [31] ☐ Trigonometry
- [32] ☐ Plane Geometry
- [33] ☐ Pre-calculus
- ☐ Other (please specify) _____

[34-35] _____

[36-37] 9. How many courses are offered in your RMP? _____

10. What kind(s) of information do you use to place students into your RMP? (check all that apply)
- [38] ☐ High school record
- [39] ☐ Scores on an admissions test (e.g., SAT, ACT) also used for placement
- [40] ☐ Scores on a locally developed placement test
- [41] ☐ Scores on a commercially available placement test
- [42-43] ☐ Other (please specify) _____

[44-45] 11. Approximately what percentage of the college's incoming freshman class is judged to be in need of one or more RMP courses? _____

[46-50] 12. On the average, how many students are enrolled in the RMP at any given point in time during the regular academic year? _____

13. Is placement into an RMP course mandatory for students who are found to be inadequately prepared in mathematics? (check all that apply)

[51] ☐ Yes
[52] ☐ No
[53] ☐ It depends on the RMP course.
[54] ☐ It depends on the student's major.
[55] ☐ It depends on the level of the student's mathematics preparation.
[56-57] ☐ Other (please specify) _____

14. [58] Are there usually enough sections of RMP courses to accommodate student need?
1 ☐ Yes 2 ☐ No

15. [59] Is a record kept for each student indicating which RMP course(s) the student is required or recommended to take?
1 ☐ Yes 2 ☐ No

16. [60] Have any efforts been made to evaluate the RMP at your college?
1 ☐ Yes 2 ☐ No

If the answer to Question 16 is yes, please proceed to Part III; otherwise proceed to Part IV.

Part III. Evaluation of Your Remedial Mathematics Program

*Please answer the remaining questions with respect to the **most thorough** evaluation of your RMP conducted to date.*

17. [61] Was the evaluation conducted as a result of a request from outside your program?
1 ☐ Yes 2 ☐ No

[62] If yes, who made the request?
1 ☐ The department
2 ☐ The college or university administration
3 ☐ A governmental unit
4 ☐ A private external agency which funds part or all of the RMP
[63-64] 5 ☐ Other (please specify) _____

18. [65] Were there funds allocated for the specific purpose of conducting an evaluation of the RMP?
1 ☐ Yes 2 ☐ No

[66] If yes, what was the source of the funds?
1 ☐ The department
2 ☐ The college or university administration
3 ☐ A governmental unit
4 ☐ A private external agency which funds part or all of the RMP
[67-68] 5 ☐ Other (please specify) _____

19. [69] Did any evaluator(s) from outside your college or university participate in evaluating the RMP?
1 ☐ Yes 2 ☐ No

[70-71] If outside evaluators participated in the evaluation, please describe the procedures used to choose them:

[72] If yes, please list the name(s) and affiliation(s) of the evaluator(s):

Name Affiliation

1. _____
2. _____

20. Which of the following questions did the evaluation address? (check all that apply)

[73] ☐ Are the RMP courses effective?
[74] ☐ Is the system for placement into RMP courses effective?
[75] ☐ Is the RMP curriculum appropriate?
[76] ☐ Is the RMP cost-effective?
[77] ☐ How should the RMP be modified?
[78-79] ☐ Other (please specify) _____

21. What kinds of information were used in the evaluation? (check all that apply)

[80] ☐ Test scores
[81] ☐ Grades, passing rates, etc. in RMP courses
[82] ☐ Grades, passing rates, etc. in subsequent mathematics courses
[83] ☐ Grades, passing rates, etc. in subsequent science/technical courses
[84] ☐ Retention rates (in the college)
[85] ☐ Graduation rates
[86] ☐ Student opinions of the RMP as measured by questionnaires, interviews, etc.
[87] ☐ Student attitudes toward mathematics as measured by questionnaires, interviews, etc.
[88] ☐ Opinions of RMP faculty of the program as measured by questionnaires, interviews, etc.
[89] ☐ Opinions of non-RMP faculty of the program as measured by questionnaires, interviews, etc.
[90] ☐ The judgment of one or more visiting experts
[91-92] ☐ Other (please specify) _____

22. Which of the following approaches were used in the evaluation? (check all that apply)

[93] ☐ An examination of the policies and practices followed in the RMP
[94] ☐ An analysis of the effects of the RMP on student performance (i.e., grades, retention rates, graduation rates, etc.)
[95-96] ☐ Other (please specify) _____

23. If the evaluation considered student performance, did it involve any of the following comparisons? (check all that apply):

[97] ☐ RMP students before and after RMP courses

[98] ☐ Students who completed an RMP course with students exempted from the course

[99] ☐ Students who completed an RMP course with students who needed, but did not take the course

[100] ☐ Students who recently completed an RMP course with students who completed the course previously

[101] ☐ Students who completed an RMP course at your college with students who completed an RMP course at another college

[102] ☐ Students who completed an RMP course at your college with a national population used to norm a standardized test

[103-104] ☐ Other (please specify) _____

[105] ☐ No comparisons were made

[106] 24. Does your RMP provide support services (e.g. tutoring, computer-assisted instruction)?
1 ☐ Yes 2 ☐ No

[107-108] If yes, please describe how, if at all, these services have been evaluated:

[109] 25. Are you satisfied with the way the RMP evaluation was designed?
1 ☐ Yes 2 ☐ No

[110-111] Comments:

[112] 26. Are you satisfied with the way the RMP evaluation was conducted?
1 ☐ Yes 2 ☐ No

[113-114] Comments:

[115-116] 27. What particular problems were encountered in conducting the evaluation?

[117] 28. Did the evaluation lead to any recommendations for changes in the RMP?
1 ☐ Yes 2 ☐ No

[118-119] If yes, please describe the recommendations:

[120] 29. Were there any changes implemented in the RMP as a result of the evaluation?
1 ☐ Yes 2 ☐ No

[121-122] If yes, please describe the changes:

[123-124] 30. What advice would you give to someone about to design or conduct an RMP evaluation?

Please attach any available descriptions of evaluation designs, or research and evaluation reports on your RMP. The information will be kept in confidence.

Part IV. Respondent

Name _____

Title _____

College _____

[125] Department _____

College Address _____

[126-127] _____

_____

Telephone Number _____

Please return to:

Geoffrey Akst
Instructional Resource Center
The City University of New York
535 E. 80th St.
New York, New York 10021

SUPPLEMENTARY TABLES

Table A1

Region: A Comparison of the Sample and the Population

(n=648)

Region	Sample	Population
West/Southwest	22%	23%
Southeast	24%	23%
Great Lakes/Plains	30%	26%
North-Atlantic	24%	28%
Total	100%	100%

$P(X^2)=.08$

Table A2

Type of Institution: A Comparison of the Sample and the Population

(n=628)

	Sample	Population
Public 2-year	32%	33%
Private 2-year	7%	11%
Public 4-year	26%	16%
Private 4-year	35%	41%
Total	100%	100%

$P(X^2)=.00$

Table A3

College Enrollment: A Comparison of the Sample and the Population

(n=616)

College Enrollment	Sample	Population
Up to 1000	28%	34%
1001-5000	43%	43%
5000+	29%	23%
Total	100%	100%

$P(X^2)=.00$

Table A4

Percent of Institutions Offering Remedial Math Courses by Whether All or No Students Are Required to Take College-level Math Courses

Required Students	
All Students (n=209)	86%
No Students (n=23)	65%

Table A5

Percent of RMP's with Various Goals by Number of Goals[a]

Number of Goals	Goal: To Prepare For: Subsequent Math Courses	Subsequent Science/ Technical Courses	A Standard of Competency
1 (n=226)	77%	3%	17%
2 (n=198)	99%	69%	29%
3 (n=118)	100%	99%	92%
4 (n=11)	100%	100%	100%
Total (n=553)	90%	49%	39%

[a]See Question 7 on the questionnaire in the Appendix for a listing of goals.

Table A6

Percent of RMP's with Various Goals
by Type of Institution

	Goal		
	To Prepare For:		
	Subsequent Math Courses	Subsequent Science/ Technical Courses	A Standard of Competency
Public 2-year (n=195)	94%	70%	39%
Private 2-year (n=27)	89%	37%	37%
Public 4-year (n=147)	91%	42%	39%
Private 4-year (n=162)	85%	35%	38%
Total (n=531)	90%	50%	39%
$P(X^2)$	.03	.00	.99

Table A7

Median Number of Students Enrolled in RMP Courses by the Year That the RMP Began

The Year the RMP Began	Median
Before 1960 (n=18)	400
1960-1964 (n=26)	460
1965-1969 (n=64)	338
1970-1974 (n=112)	200
1975-1979 (n=152)	105
1980 and Later (n=74)	35
Total (n=538)	125

Table A8

Percent of RMP's with Various Enrollments

(n=538)

Enrollment	
Up to 50	31%
51-300	39%
301+	30%
Total	100%

Median=125

Table A9

Percent of RMP's Which Provide Support Services

(n=264)

Provide Support Services	88%
Don't Provide Services	13%
Total	100%

Table A10

Percent of RMP's Which Provide Support Services by the Percent of Freshmen in Need of Remedial Math Courses

Percent of Freshmen in Need of RMP Courses	Percent Providing Support Services
1-20% (n=77)	81%
21-49% (n=82)	84%
50-99% (n=85)	95%
Total (n=244)	87%

$P(X^2)=.01$

Table A11

Percent of RMP's with an Insufficient Number of Sections by Type of Institution

Public 2-year (n=195)	16%
Private 2-year (n=5)	7%
Public 4-year (n=146)	18%
Private 4-year (n=160)	6%
Total (n=528)	13%

$P(X^2)=.00$

Table A12

Percent of Institutions with RMP's with Selected Ranges of Freshmen in Need of Remedial Math Courses

(n=508)

Percent of Freshmen in Need of Remedial Math Courses	Percent of Institutions
1-20%	33%
21-49%	31%
50-100%	36%
Total	100%

Median=35%

Table A13

Percent of Institutions with RMP's with at Least 50% of the Students in Need of Remedial Math Courses

Public 2-year (n=176)	48%
Private 2-year (n=25)	44%
Public 4-year (n=136)	37%
Private 4-year (n=155)	21%
Total (n=492)	36%

$P(X^2)=.00$

Table A14

Percent of RMP's Which Use
Various Types of Placement Information
by Type of Institution

	Type of Placement Information Used			
	HS Record	Admissions Test	Local Test	Commercial Test
Public 2-year (n=192)	50%	31%	52%	34%
Private 2-year (n=27)	41%	26%	59%	30%
Public 4-year (n=147)	47%	51%	61%	19%
Private 4-year (n=161)	49%	53%	44%	37%
Total (n=527)	48%	43%	52%	30%
$P(X^2)$	.83	.00	.02	.00

Table A15

Percent of RMP's Which Use Various Numbers of Types of Placement Information[a]

(n=549)

Number of Types of Placement Information Used	Percent of Institutions
1	42%
2	32%
3	24%
4	2%
5+	0%
Total	100%

Median=2

[a]See Question 10 on the questionnaire in the Appendix for a listing of types of placement information.

Table A16

Percent of RMP's in Which Placement Is Mandatory for All Students by Type of Institution

Public 2-year (n=194)	31%
Private 2-year (n=27)	67%
Public 4-year (n=148)	43%
Private 4-year (n=162)	48%
Total (n=531)	41%

$P(X^2)=.00$

Table A17

Percent of RMP's Which Keep a Student Record of Required or Recommended Courses by Type of Institution

Public 2-year (n=192)	66%
Private 2-year (n=27)	85%
Public 4-year (n=144)	74%
Private 4-year (n=158)	79%
Total (n=521)	73%

$P(X^2)=.02$

Table A18

Percent of RMP's Which Keep a Student Record of Required or Recommended Courses by Whether Tests Are Used for Placement

	Percent Keeping a Record
Tests Used (n=493)	77%
Tests Not Used (n=44)	32%
Total (n=537)	73%

$P(X^2)=.00$

Table A19

Percent of RMP's Which Keep a Student Record of Required or Recommended Courses by Whether Placement Is Mandatory

	Percent Keeping a Record
Placement Mandatory (n=222)	90%
Placement Not Mandatory (n=319)	61%

Table A20

Percent of Institutions with RMP's Which Evaluated Their RMP by Type of Institution

Public 2-year (n=195)	43%
Private 2-year (n=27)	59%
Public 4-year (n=148)	54%
Private 4-year (n=163)	49%
Total (n=533)	49%

$P(X^2)=.15$

Table A21

Percent of Institutions with RMP's Which Evaluated Their RMP by the Year That the RMP Began

The Year That the RMP Began	
Before 1960 (n=18)	57%
1960-1964 (n=27)	52%
1965-1969 (n=66)	47%
1970-1974 (n=115)	52%
1975-1979 (n=153)	51%
1980 and later (n=80)	40%
Total (n=459)	49%

$P(X^2)=.58$

Table A22

Percent of Institutions with RMP's Which Evaluated Their RMP by Goals

Goal	An RMP Goal	Not an RMP Goal	P(X^2)
To Prepare For:			
Subsequent Math Courses	49% (n=500)	47% (n=53)	.87
Subsequent Science/ Technical Courses	51% (n=272)	48% (n=281)	.53
A Standard of Competency	54% (n=215)	46% (n=338)	.13

Table A23

Percent of Institutions with RMP's Which Evaluated Their RMP by College Enrollment

College Enrollment	Percent Which Evaluated
Up to 1000 (n=136)	45%
1001-5000 (n=238)	51%
5001+ (n=171)	50%
Total (n=545)	49%

$P(X^2)=.48$

Table A24

Percent of Institutions with RMP's Which Evaluated Their RMP by Whether a Test Is Used for Placement

Test Used (n=503)	52%
Test Not Used (n=46)	22%
Total (n=549)	49%

$P(X^2)=.00$

Table A25

Percent of Institutions with RMP's Which Evaluated Their RMP by Whether Placement Is Mandatory

Mandatory (n=228)	63%
Not Mandatory (n=205)	35%

Table A26

Percent of Institutions with RMP's Which Evaluated Their RMP by Whether Student Records Are Kept of Required or Recommended Courses

Record Kept (n=394)	59%
Record Not Kept (n=149)	23%
Total (n=543)	49%

$P(X^2)=.00$

Table A27

Percent of Institutions Which Evaluated Their RMP by Whether All or No Students are Required to Take College-level Math Courses

All Students (n=179)	57%
No Students (n=14)	20%

Table A28

Percent of Evaluating Institutions Using Various Numbers of Approaches[a] in the Evaluation

(n=273)

Number of Approaches	
1	60%
2	39%
3	1%
Total	100%

Median=1

[a]See Question 22 on the questionnaire in the Appendix for a listing of approaches.

Table A29

Percent of Evaluating Institutions Using Various Numbers of Comparisons[a] in the Evaluation

(n=245)

Number of Comparisons	
1	58%
2	27%
3	10%
4	4%
5	1%
Total	100%

Median=1

[a]See Question 23 on the questionnaire in the Appendix for a listing of comparisons (designs).

Table A30

Percent of Evaluating Institutions Addressing Various Numbers of Questions[a] in the Evaluation

(n=263)

Number of Questions	
1	12%
2	22%
3	24%
4	26%
5	16%
6	0%
Total	100%

Median=3

[a]See Question 20 on the questionnaire in the Appendix for a listing of evaluative questions.

Table A31

Percent of Evaluating Institutions Using Various Numbers of Kinds of Information[a] in the Evaluation

(n=267)

Number of Kinds of Information	
1	3%
2	14%
3	17%
4	22%
5	20%
6	10%
7	6%
8	6%
9	1%
10	1%
Total	100%

Median=4

[a]See Question 21 on the questionnaire in the Appendix for a listing of kinds of information.

Table A32

Percent of Evaluating Institutions Which Followed Various Single Approaches in the Evaluation

(n=152)

Single Approach Followed	
Examination of Policies and Practices Followed in the RMP	19%
Analysis of the Effects of the RMP on Student Performance	80%
Other	1%
Total	100%

Table A33

Percent of Evaluating Institutions Which Addressed Various Single Questions in the Evaluation

(n=31)

Single Question Addressed	
Are the Courses Effective?	77%
Is the Placement System Effective?	19%
Is the Curriculum Appropriate?	0%
Is the RMP Cost-effective?	0%
How Should the RMP Be Modified?	3%
Other	0%
Total	100%

Table A34

Percent of Evaluating Institutions Which Addressed Various Questions in the Evaluation by Whether the Evaluation Was the Result of an Outside Request

Question	Outside Request (n=104)	No Outside Request (n=156)	Total (n=260)	P(X^2)
Are the Courses Effective?	95%	94%	94%	.79
Is the Placement System Effective?	83%	69%	74%	.02
Is the Curriculum Appropriate?	61%	58%	59%	.82
Is the RMP Cost-effective?	32%	24%	27%	.20
How Should the RMP Be Modified?	46%	62%	55%	.02

Table A35

Percent of Evaluating Institutions Which Used Various Kinds of Information in the Evaluation by Whether the Evaluation Was the Result of an Outside Request

Kinds of Information	Outside Request (n=107)	No Outside Request (n=157)	Total (n=264)	P(X^2)
Test Scores	69%	75%	72%	.41
Grades, Passing Rates, etc. in Remedial Math Courses	79%	82%	80%	.65
Grades, Passing Rates, etc. in Subsequent Math Courses	70%	72%	71%	.85
Grades, Passing Rates, etc. in Subsequent Science/ Technical Courses	20%	16%	17%	.54
College Retention Rates	51%	40%	44%	.10
College Graduation Rates	10%	14%	13%	.48
Student Opinion of the RMP	49%	48%	48%	.96
Student Attitudes Toward Math	31%	24%	27%	.24
RMP Faculty Opinions of the Program	49%	36%	41%	.05
Non-RMP Faculty Opinions of the Program	21%	14%	17%	.22
Judgment of Visiting Experts	11%	5%	8%	.11

Table A36

Percent of Evaluating Institutions Which Used Various Kinds of Information in the Evaluation by Whether Funds Were Allocated for the Evaluation

Kinds of Information	Funds Allocated (n=42)	Funds Not Allocated (n=225)	Total (n=267)	P(X^2)
Test Scores	79%	72%	73%	.46
Grades, Passing Rates, etc. in Remedial Math Courses	81%	80%	81%	1.00
Grades, Passing Rates, etc. in Subsequent Math Courses	67%	72%	72%	.57
Grades, Passing Rates, etc. in Subsequent Science/ Technical Courses	21%	16%	17%	.57
College Retention Rates	55%	42%	44%	.17
College Graduation Rates	14%	12%	13%	.94
Student Opinion of the RMP	55%	48%	49%	.49
Student Attitudes Toward Math	31%	26%	27%	.66
RMP Faculty Opinions of the Program	45%	40%	41%	.64
Non-RMP Faculty Opinions of the Program	26%	15%	17%	.11
Judgment of Visiting Experts	29%	4%	8%	.00

Table A37

Percent of Evaluating Institutions Which Used Various Single Comparisons in the Evaluation

(n=102)[a]

Single Comparison Used	
Students Before and After RMP	61%
Students Completing RMP vs. Exempted Students	22%
Students Completing RMP vs. Students Needing But Not Taking	10%
Recent RMP Completers vs. Previous RMP Completers	2%
Local RMP Completers vs. RMP Completers at Another College	2%
Local RMP Completers vs. a National Population	2%
Other	2%
Total	100%

[a]Evaluating institutions which did not use student comparisons in the evaluation are excluded from this analysis.

Table A38

Approaches Used in the Evaluation Which Are Significantly Related to Questions Asked in the Evaluation

Question	Approach	Direction of Relationship[a]	P(X^2)
1) Are the RMP Courses Effective?	-	-	-
2) Is the System for Placement into RMP Courses Effective?	Examination of Policies and Practices Followed in the RMP	+	.00
3) Is the RMP Curriculum Appropriate?	Examination of Policies and Practices Followed in the RMP	+	.00
4) Is the RMP Cost-effective?	-	-	-
5) How Should the RMP Be Modified?	Examination of Policies and Practices Followed in the RMP	+	.00

[a]A "+" sign indicates that evaluating institutions which addressed the question were more likely to use the indicated kind of approach; a "-" sign indicates that evaluating institutions which addressed the question were less likely to use the indicated kind of approach.

Table A39

Comparisons Used in the Evaluation Which Are Significantly Related to Approaches Used in the Evaluation

Approach	Comparison	Direction of Relationship[a]	P(X^2)
Examination of Policies and Practices Followed in the RMP	Students Completing RMP vs. Exempted Students	+	.05
	Recent RMP Completers vs. Previous RMP Completers	+	.00
Analysis of the Effects of the RMP on Student Performance	Students Completing RMP vs. Exempted Students	+	.02
	No Comparisons Made	-	.00

[a]A "+" sign indicates that evaluating institutions which used the approach were more likely to use the indicated comparison; a "-" sign indicates that evaluating institutions which used the approach were less likely to use the indicated comparison.

Table A40

Comparisons Used in the Evaluation Which Are Significantly Related to Questions Asked in the Evaluation .

Question	Comparison	Direction of Relationship[a]	P(X²)
1) Are the RMP Courses Effective?	-	-	-
2) Is the System for Placement into RMP Courses Effective?	Students Completing RMP vs. Exempted Students	+	.01
3) Is the RMP Curriculum Appropriate?	Recent RMP Completers vs. Previous RMP Completers	+	.04
4) Is the RMP Cost-effective?	Students Completing RMP vs. Students Needing But Not Taking Remedial Math Courses	+	.02
	Recent Completers vs. Previous RMP Completers	+	.01
5) How Should the RMP Be Modified?	Students Before and After RMP	+	.02
	Students Completing RMP vs. Exempted Students	+	.02
	Recent RMP Completers vs. Previous RMP Completers	+	.00
	No Comparisons Were Made	-	.02

[a]A "+" sign indicates that evaluating institutions which addressed the question were more likely to use the indicated kind of comparison; a "-" sign indicates that evaluating institutions which addressed the question were less likely to use the indicated kind of comparison.

Table A41

Kinds of Information Used in the Evaluation Which Are Significantly Related to Approaches Used in the Evaluation

Approach	Kinds of Information	Direction of Relationship[a]	P(X^2)
Examination of Policies and Practices Followed in the RMP	Grades, Passing Rates, etc. in Subsequent Math Courses	-	.05
	Student Opinions of the RMP	+	.00
	Student Attitudes Toward Math	+	.00
	RMP Faculty Opinions of the Program	+	.00
	Judgment of One or More Visiting Experts	+	.00
Analysis of the Effects of the RMP on Student Performance	Test Scores	+	.00
	Grades, Passing Rates, etc. in Remedial Math Courses	+	.05
	Grades, Passing Rates, etc. in Subsequent Math Courses	+	.00
	College Retention Rates	+	.00

[a]A "+" sign indicates that evaluating institutions which used the approach were more likely to use the indicated kind of information; a "-" sign indicates that evaluating institutions which used the approach were less likely to use the indicated kind of information.

Table A42

Kinds of Information Used in the Evaluation Which Are Significantly Related to Questions Asked in the Evaluation

Question	Kinds of Information	Direction of Relationship[a]	P(X^2)
1) Are the RMP Courses Effective?	Grades, Passing Rates, etc. in Subsequent Math Courses	+	.00
2) Is the System for Placement into RMP Courses Effective?	Grades, Passing Rates, etc. in Remedial Math Courses	+	.00
	Grades, Passing Rates, etc. in Subsequent Math Courses	+	.00
	RMP Faculty Opinions of the Program	+	.02
	College Retention Rates	+	.03
3) Is the RMP Curriculum Appropriate?	Test Scores	+	.02
	College Retention Rates	+	.03
	Student Opinions of the RMP	+	.03
	RMP Faculty Opinions of the Program	+	.03
	Non-RMP Faculty Opinions of the Program	+	.03
4) Is the RMP Cost-effective?	College Retention Rates	+	.04
	College Graduation Rates	+	.00
	Student Opinions of the RMP	+	.03
	Student Attitudes Toward Math	+	.04
	RMP Faculty Opinions of the Program	+	.00
	Non-RMP Faculty Opinions of the Program	+	.00

Table A42

(continued)

Question	Kinds of Information	Direction of Relationship[a]	P(X^2)
5) How Should the RMP Be Modified?	Test Scores	+	.02
	Grades, Passing Rates. etc. in Remedial Math Courses	+	.05
	Student Opinions of the RMP	+	.01
	Student Attitudes Toward Math	+	.04
	RMP Faculty Opinions of the Program	+	.00
	Non-RMP Faculty Opinions of the Program	+	.02

[a]A "+" sign indicates that evaluating institutions which addressed the question were more likely to use the indicated kind of information; a "-" sign indicates that evaluating institutions which addressed the question were less likely to use the indicated kind of information.

Table A43

Kinds of Information Used in the Evaluation Which Are Significantly Related to Comparisons Used in the Evaluation

Comparison	Kinds of Information	Direction of Relationship[a]	P(X^2)
Students Before vs. After RMP	Test Scores	+	.00
Students Completing RMP vs. Exempted Students	Test Scores	+	.01
	Grades, Passing Rates, etc. in Subsequent Math Courses	+	.00
Students Completing RMP vs. Students Needing But Not Taking Remedial Math Courses	Grades, Passing Rates, etc. in Subsequent Math Courses	+	.03
	Grades, Passing Rates, etc. in Subsequent Science/ Technical Courses	+	.00
	RMP Faculty Opinions of the Program	+	.00
Recent RMP Completers vs. Previous RMP Completers	Test Scores	+	.01
	Graduation Rates	+	.01
	Student Opinions of the RMP	+	.03
	RMP Faculty Opinions of the Program	+	.00
Local RMP Completers vs. a National Population	Judgment of One or More Visiting Experts	+	.00
Local RMP Completers vs. Completers at Another College	RMP Faculty Opinions of the Program	+	.00

[a]A "+" sign indicates that evaluating institutions which used the comparison were more likely to use the indicated kind of information; a "-" sign indicates that evaluating institutions which used the comparison were less likely to use the indicated kind of information.

Table A44

Percent of Evaluating Institutions Which Compared Recent RMP Completers with Previous RMP Completers by the Year the RMP Began

The Year the RMP Began	
Before 1960 (n=9)	22%
1960-1964 (n=13)	8%
1965-1969 (n=28)	4%
1970-1974 (n=50)	12%
1975-1979 (n=72)	10%
1980 and later (n=31)	7%
Total (n=203)	9%

$P(X^2)=.60$

Table A45

Percent of Evaluating Institutions Which Compared Students Completing the RMP with Students Needing But Not Taking RMP Courses by Whether There Was a Sufficient Number of Sections of RMP Courses

The Number of Sections Was:	Used the Comparison
Sufficient (n=215)	22%
Insufficient (n=28)	32%
Total (n=243)	24%

$P(X^2)=.36$

Table A46

Percent of Evaluating Institutions Which Were Satisfied with the Design of the Evaluation by Whether Various Comparisons Were Used

Comparison	Comparison Not Used		Comparison Used		
	n	Percent Satisfied	n	Percent Satisfied	P(X^2)
Students Before and After RMP	95	68%	132	78%	.14
Students Completing RMP vs. Exempted Students	131	66%	96	84%	.00
Students Completing RMP vs. Student Needing But Not Taking Remedial Math Courses	172	73%	55	78%	.53
Recent RMP Completers vs. Previous RMP Completers	202	73%	25	84%	.33
Local RMP Completers vs. Completers at Another College	220	74%	7	86%	.78
Local RMP Completers vs. a National Population	209	74%	18	78%	.92
No Comparisons Were Made	189	80%	38	45%	.00

Table A47

Percent of Evaluating Institutions at Which Evaluations Led to Recommendations for Change

(n=230)

Recommendations for Change	56%
No Recommendations for Change	44%
Total	100%

Table A48

Percent of Evaluating Institutions at Which Recommended RMP Changes Were Implemented as a Result of the Evaluation

(n=230)

Recommended RMP Changes Were Implemented	55%
Recommended RMP Changes Were Not Implemented	45%
Total	100%

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