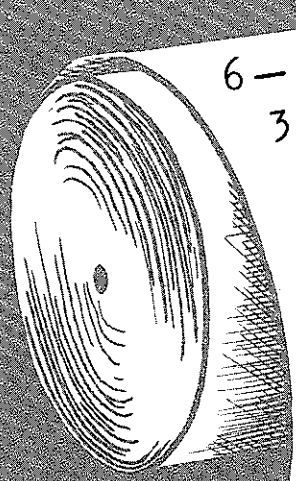

Volume XIX, No. 3

TEXAS MATHEMATICS TEACHER

May-June 1972

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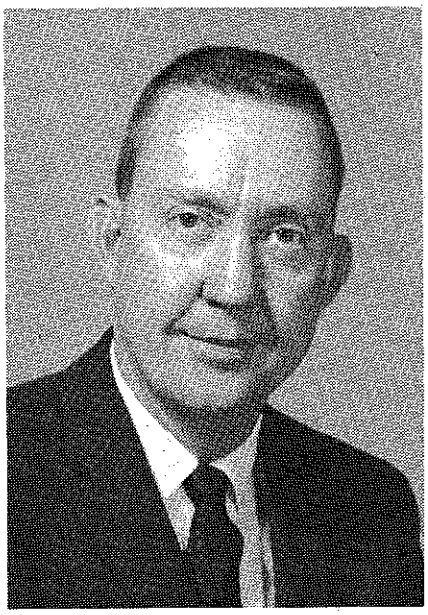
LETTER FROM THE PRESIDENT



James E. Carson

We are running a little behind time on our last two publications of the journal, but bear with us. They will be there soon.

The 50th Annual Convention at Chicago was very informative. They went all out and put on a fine convention. Some 8000 people were present. Of that number, Texas was well represented. We really had a great time and enjoyed many enlightening lectures. We met with the Texas people for breakfast Wednesday morning and had a good time with many in attendance. Thanks to Anne Woods, T.A.S.M. president, for getting us together. It was a nice gesture on Anne's part.

For the people who have not heard about the CASMT Convention for next year, it will be held February 8-10. It will again be held at the University of Texas in the Thompson Convention Center. They have made arrangements with the University people to have exhibits. They have also promised to hold it every year thereafter in October if they continue to hold it at all, and I think this is their desire. I am not pleased with the February meeting date but I wasn't consulted. Since we have our membership drive in the fall, I wish to remind the members to be sure and send their dues in at the beginning of school. You can send them to me or any of our local Council will be glad to collect your state dues; still $2.00, so don't forget to join and keep your journal coming.

We are still desperate for articles for the journal so why not support your journal by supplying us with an article. We like to keep up with what the various schools are doing throughout the State.

I would like to thank each of you for the vote of confidence that you gave me at the Annual meeting. It is so nice to be president of such an organization. You have been staunch in the support that you have given me, and I am not sure that I could have made it without your support.

Have a nice summer and forget school work for a change. We will be looking forward to seeing you again next fall. We will have another T.C.T.M. Workshop at J. Frank Dobie High School in Pasadena Independent School District on September 16, 1973. Make your plans to attend. By all means be making plans for the N.C.T.M. Annual meeting which will be held in Houston April 25-28, 1973.

The Effects of a Laboratory on Attitudes in College Freshman Mathematics

DR. CAMERON B. DOUTHITT
Director, Developmental Studies
Alvin Junior College
Alvin, Texas

INTRODUCTION

The withdrawal-failure rate (denoted W/F) in freshman mathematics courses at the University of Houston is approximately 30%) while the W/F rate among "risk" students is approximately 70%). Risk students are those graduates from the top quarter of their high school graduating class who achieved a total score of less than 900 and a score of less thatn 450 on the math section of the Scholastic Aptitude Test. Risk students come from predominantly Negro high schools in the Houston area. They received high grades while in high school, but for various reasons they do not succeed in college. Perhaps the major contributor to their lack of success in college is their attitude towards mathematics.

A dissertation study was conducted at the University of Houston during the fall of 1970 to determine the effects of a mathematics laboratory on achievement, attitude, and the W/F rate. This is a summary of the effects of the laboratory on attitudes.

RESEARCH DESIGN

The control and experimental groups were composed of both risk students and non risk students who registered for analytic geometry in the fall of 1970. The risk students were identified by means of the class roster for entering freshmen provided by the Office of Admissions at the University of Houston. A list was made of the names of those risk students. A letter explaining the experimental program was sent to each of those students and an invitation was given to each student requesting that he meet during summer orientation for a more detailed discussion of the program.

In that meeting, the experimental program was explained and emphasis was given to the fact that no charge was required for the laboratory. During the summer orientation program, 26 risk students enrolled in the experimental program, 13 in the 8-9 a.m. Monday, Wednesday, Friday section and 13 in the 9-10 a.m. Monday, Wednesday, Friday section. The two special sections were completed with non risk students during regular registration. Those two special sections constituted the experimental group. It was composed of 26 risk students and 42 non risk students. The experimental group attended one hour lectures on Mondays and Fridays and worked in the laboratory for one hour on Wednesdays.

The control group consisted of 28 risk students and 84 non risk students who registered for one of five sections of analytic geometry other than those provided for the experimental group. Students in the control group attended the usual lecture type course for three hours per week and did not attend the laboratory. Table I gives the time schedule for the experimental program.

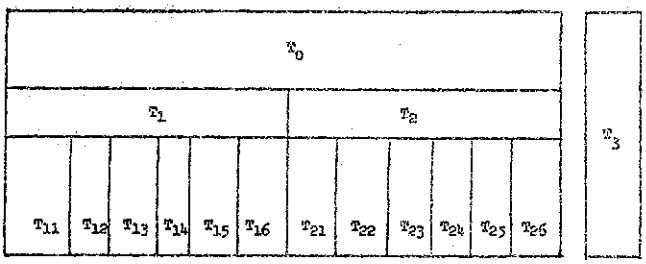
TABLE I

SCHEDULE FOR EXPERIMENTAL GROUP

	Monday	Wednesdays	Fridays
8-9 AM Section	Lecture and problem discussion	Laboratory (tutoring only no learning aids)	Lecture and problem discussion
9-10 AM Section	Lecture and problem discussion	Laboratory (tutoring and laboratory materials)	Lecture and problem discussion

TABLE II

LABORATORY DESIGN FOR EXPERIMENTAL PROGRAM



The mathematics laboratory was designed according to the diagram in Table II. The experimental group T_0 was divided into two subgroups, T_1 and T_2. Group T_1 was composed of six subgroups with approximately 6 students in each subgroup. Students in group T_1 used only the textbook, and with the aid of tutors worked problems at their desks or chalk-

board. Group T_2 was composed of six subgroups or approximately 5 students in each subgroup. Group T_2 used a variety of materials including programmed texts, filmstrips, tapes, models and transparencies. One lecture class of the experimental group was composed entirely of students in T_1, while the other lecture class contained only students in T_2.

T_0 —Experimental group (68 students)

T_1 —36 students of experimental group (no use of learning aids)

T_2 —32 students of experimental group (use of learning aids)

T_{11}, T_{12}, T_{13}, T_{14}, T_{15}, T_{16} —Subgroups of T_1 with approximately 6 students in each subgroup

T_{21}, T_{22}, T_{23}, T_{24}, T_{25}, T_{26} —Subgroups of T_1 with approximately 5 students in each subgroup

T_3 —Control group (112 students with no laboratory)

There were twelve tutors who worked in the mathematics laboratory on Wednesdays. Each tutor was assigned to a small group of students for the entire semester. The tutors were Mathematics-Teacher Education majors, each of whom had completed at least eighteen semester hours in mathematics and who were enrolled in Secondary Education 432. The course combined methods of teaching mathematics with field experiences. Their tutorial assignment was part of the field experiences required in that course. The instructor of the experimental group served as a laboratory supervisor in order to cooordinate the use of materials and techniques designed for use in each laboratory session.

ANALYSIS OF DATA

Null Hypotheses

To determine the effectiveness of the laboratory on attitudes the Aiken-Dreger Mathematics Attitude Scale (Revised) was administered as a pre and post test to both experimental and control groups. The following null hypotheses were tested:

1. There is no significant difference in pre-attitude between non-risk students in the experimental group and risk students in the experimental group.

2. There is no significant difference in pre-attitude between non-risk students in the experimental group and non-risk students in the control group.

3. There is no significant difference in pre-attitude between risk students in the experimental group and risk students in the control group.

4. There is no significant difference in pre-attitude between non-risk students in the control group and risk students in the control group.

5. There is no significant difference in pre-attitude between students in the experimental group and students in the control group.

6. There is no significant difference in pre-attitude between non-risk students in T_1 and non-risk students in T_2.

7. There is no significant difference in pre-attitude between risk students in T_1 and risk students in T_2.

8. There is no significant difference in pre-attitude between students in T_1 and students in T_2.

9. There is no significant difference in pre-attitude between non-risk students in T_1 and students in T_2.

10. There is no significant difference in pre-attitude between non-risk students in T_2 and risk students in T_2.

11. There is no significant difference in post-attitude between non-risk students in the experimental group and risk students in the experimental group.

12. There is no significant difference in post-attitude between non-risk students in the experimental group and non-risk students in the control group

13. There is no significant difference in post-attitude between risk students in the experimental group and risk students in the control group.

14. There is no significant difference in post-attitude between non-risk students in the control group and students in the control.

15. There is no significant difference in post-attitudes between students in the experimenal group and students in the control group.

Table III gives a summary of the analysis of these null hypotheses. All computations were performed by a UNIVAC 1108 computer at the University of Houston Computer Center. The computer program analyzed only the data for the students who received grades in the course. There were 48 students in the experimental group and 63 students in the control group for this analysis.

TABLE III

SUMMARY OF ANALYSES OF NULL HYPOTHESES CONCERNING ATTITUDE

Null Hypothesis	$\bar{X}$	$\bar{Y}$	Correlation Coefficient	Test of Significance	df	Result
1.	52.4	47.4	$r_{Pbi} = .170$	$t = 1.169$	46	n.s.
2.	52.4	53.8	$r_{Pbi} = -.053$	$t = -.446$	70	n.s.
3.	47.4	51.4	$r_{Pbi} = .121$	$t = -.739$	37	n.s.
4.	53.8	51.4	$r_{Pbi} = .080$	$t = .629$	61	n.s.
5.	50.3	43.3	$r_{Pbi} = .266$	$t = 2.878$	109	**
6.	52.8	51.8	$r_{Pbi} = .034$	$t = -.169$	25	n.s.
7.	50.8	44.8	$r_{Pbi} = .199$	$t = .839$	19	n.s.
8.	52.1	47.8	$r_{Pbi} = .147$	$t = 1.007$	46	n.s.
9.	52.8	50.8	$r_{Pbi} = .065$	$t = .326$	25	n.s.
10.	51.8	44.8	$r_{Pbi} = .222$	$t = .994$	19	n.s.
11.	56.9	51.3	$r_{Pbi} = .164$	$t = 1.128$	46	n.s.
12.	56.9	47.9	$r_{Pbi} = .362$	$t = 3.250$	70	**
13.	52.3	49.1	$r_{Pbi} = .060$	$t = .365$	37	n.s.
14.	47.9	49.1	$r_{Pbi} = -.043$	$t = -.333$	61	n.s.
15.	54.4	35.5	$r_{Pbi} = .551$	$t = 6.892$	109	**

$\bar{X}$ - mean of 1st group mentioned in hypothesis
$\bar{Y}$ - mean of 2nd group mentioned in hypothesis
** - significant at .01 level
n.s. - not significant

RESULTS

Null hypotheses (5), (12) and (15) were rejected while all other null hypotheses could not be rejected. A brief explanation is in order to understand why a significant difference was found when testing some hypotheses and the difference was not significant in other cases.

In testing null hypotheses (1), (6), (7), (8), (9) and (10), it was observed that in the experimental group the pre-attitude mean score of risk students was approximately the same as the non risk students' pre-attitude mean score. Hence, none of the null hypotheses (1), (6), (7), (8), (9) or (10) were rejected.

One explanation of why null hypothesis (5) was rejected and the other null hypotheses (1) through (10) were not rejected seemed to be that the values of N increased when the total experimental group (N 48) was compared to the total control group (N 63). It is observed when using the t-test as a test of significance that as the degrees of freedom increase, a smaller value of t is required for significance.

Null hypotheses (11) was not rejected. Hence, the assumption was made that non-risk students in the experimental group and risk students in the experimental group left the experimental program with approximately the same attitude towards mathematics. Both groups showed an increase in mean attitude score at the end of the semester.

Null hypothese (12) was rejected. This was possibly the most interesting result of the study. The non-risk students in the experimental group indicated an increase in attitude while the non-risk students in the control group indicated a decrease in attitude. it was concluded that the laboratory was the major factor which caused that result.

An important result was noted from testing null hypotheses (15). Comparison of the means with those computed when testing null hypotheses (15) yielded an increase in mean attitude score (from 50.3 to 54.4) for experimental group students and a decrease in mean attitude score (from 43.3 to 35.5) for the control group students. It was assumed that the laboratory contributed significantly to that result.

CONCLUSIONS AND SUGGESTIONS

Several conclusions were drawn from results of the study. They are summarized below.

1. A mathematics laboratory can produce more positive attitudes toward mathematics.

2. Attitude seemed to be the most important single factor in the program. It definitely influenced achievement and the W/F rate.

The attitude and personality of the tutors appeared to be very significant in keeping the students in the course. It was felt by the instructor of the experimental group that the instructor's attitude and the tutors' attitudes played a major role in the program.

3. There is no significant difference in achievement between students attending a laboratory with only tutoring and students attending a laboratory with tutoring and laboratory materials, i.e., utilization of laboratory materials did not seem to affect achievement. However, it did affect attitude. The group which used the programmed texts and other aids appeared much happier and informal in class lectures and discussions than did the group which did not use innovative materials in the laboratory.

4. Tutors and students who have participated in a mathematics laboratory think that a laboratory is beneficial and should be utilized in college freshman mathematics courses.

5. Community colleges as well as universities should include mathematics laboratories as a part of the instructional program.

Proposed Amendment by the Executive Committee of T.C.T.M.

ARTICLE III —
MEMBERSHIP AND DUES

Section 1. Eligibility for Membership. All persons interested in the purpose and functions of the organization shall be eligible for membership.

Section 2. Annual Dues. These shall be set at the annual meeting.

a. Active Members. Any person may become an active member by paying annual dues, payable at any meeting of the Council or by mail. The membership gives the right to vote and entitles one to receive any bulletins and communications of the organization.

   The membership year of the Council shall correspond with the fiscal year for the Council and both shall be defined as the period of time from September 1 extending through August 31.

b. Associate Members. Any student may become an associate member by paying annual dues, which shall entitle him to receive bulletins and communications of the organization.

c. Honorary Members. Any person who has rendered service which this organization may desire to recognize may become an honorary member upon recommendation of the executive committee. An honorary member shall be exempt from paying dues and shall have all privileges of active membership except voting and holding office.

d. Institutional Membership. T.C.T.M. will make available institutional subscriptions (to Texas Mathematics Teacher) to all schools in Texas.

* * * * *

NOTE: The next annual meeting of T.C.T.M. will be held February 9, 1973 during C.A.S.M.T.

BALLOT

FOR ___ AGAINST ___

Mark your ballot and send to James E. Carson at 3010 Bayshore Drive, Pasadena, Texas 77501 by September 1, 1972.

So What's New?

by Boyd Henry
Department of Mathematics
College of Idaho
Caldwell, Idaho 83605

I have before me a junior high mathematics book. On page 9 is a problem typical of those appearing in many such texts. It reads as follows. "Express 3432_6 in the decimal scale." On the next page the student is asked to change $.712_{10}$ to its base five equivalent. On page 12 the student is asked to perform calculations in bases four, five, seven, nine, and eleven. Some teachers are quite critical of problems such as these appearing in the "new" math books and long for a return to math as it was taught in the "good old days". Those who wish that those days would return to the math classroom may be dismayed to learn that the problems referred to above are taken from a junior high text called *The Foundations of Higher Arithmetic* by B. F. Sisk and published by Silver, Burdett and Company in 1905! Teaching the structure of the number system with the aid of bases other than ten is not something new. It's back again. The books printed during the second quarter of this century seem to have dropped several topics, but many are back again because we have found them to be of value after all.

Some teachers in the elementary schools criticize the presence in their texts of problems involving "box" arithmetic on the basis that their students (or perhaps they themselves) are confused by the appearance of this new type of problem. A typical problem may read $5 + \square = 9$. One third grade book, for example, states this type of problem as follows. "4 and ___ are 11." Teachers criticizing this material because it is new are advised that the above problem is taken from page 33 of a text for grade three of a series published by Scott, Foresman and Company titled *Standard Service Arithmetic*. It was written by Knight, Studebaker, and Ruch and published in 1926. Filling in the blanks as is done in box arithmetic is not new. It's back again.

The distinction between number and numeral is not a part of the "new" math either. On page 1 of a text written by Philips and Anderson to be introduced in the fifth grade, titled *Silver-Burdett Arithmetics – Complete Book* published in 1913 is an attempt to distinguish between number and numeral. The authors make the following statement. "Notation is the method of expressing numbers by means of characters called *numerals*." Authors in those days had at least as much difficulty in defining number as do authors today. Philips and Anderson handled the definition by sidestepping it, but perhaps did succeed in giving the student some concept of the abstract meaning of number. They stated, "A *number* is the direct answer to the question, HOW MANY?"

What about inequalities? This seems to be another topic assumed by many teachers to be new. Not necessarily so. In the Scott, Foresman third grade text referred to above, on page 47 one can find such questions as, "Is 8 cents more than 9 cents?" and "Is 7 cents less than 8 cents?".

What about terminology? Were junior high students at the turn of the century introduced to such terms as the commutative, associative, and distributive laws? On pages 13 and 14 of the text by Sisk published in 1905 referred to above, we find the associative and commutative laws first stated as principles of addition, then named. They read as follows. "3. The sum is the same regardless of the order of the grouping of the addends. 4. The sum is the same regardless of the order of performing the operation. Principle 3 is called the associative law of addition; principle 4, the commutative law of addition." On page 19 the author gives similar definitions of the associative and commutative laws of multiplication. On page 28, he briefly introduces the student to the distributive law.

As is true of authors today, authors at the turn of the century had their moments of carelessness. At first reading, it would appear that Sisk made a very careless error on page 17 in stating, "Subtraction is the inverse of addition; therefore the associative and commutative laws hold for subtraction." The author failed to show an example of what he had in mind in making the statement. Since by today's definition of associative and commutative, this is such a glaring error, it is quite probable that the author had a somewhat modified definition of these laws in mind. For example, he may have meant by the "commutative law for subtraction" that $10 - 5 - 3 = 10 - 3 - 5$. Similarly, the "associative law for subtraction" might have meant that $20 - (4 + 5) - 6 = 20 - 4 - (5 + 6)$. The author committed a similar faux pas on page 25 by stating, "Division is the inverse of multiplication; therefore, the associative and commutative laws hold in division." The carelessness gremlins have always been at work, even in the best prepared texts. In a present day publication, for example, written by highly respected mathematics educators, we can find the following

bit of misinformation. " . . . the way to add fractions having the same denominator is simply to add numerators." The student following such advice carefully would find the sum of 2/7 and 3/7 to be 5.

Even the best turn-of-the-century authors handled notation in a way that would make today's purists shudder. In explaining "casting out nines" as a device for checking one's computations, on page 27 Sisk wrote, "32798 = 29 = 11 = 2."

What about the vocabulary students must master in the "new" math today? Did students early in the century need to have command of such a large vocabulary to succeed in mathematics? Leafing through the pages of some of the old books indicates that students in those days needed to know most of the terms found in today's texts plus many more. How many of the following terms found in turn-of-the-century math texts for junior high students could you define? Involution, evolution, index notation, scale, radix, periods, senary scale, ternary scale, minuend, aliquot part, partitive division, unitate method, similar fractions, circulating decimal, pure circulate, mixed circulate, antecedent, consequent, compound proportion, partitive proportion, reduction ascending, reduction descending, and homologous parts are only some of the terms used in the old books. Alas! Topics discussing ragged decimals and vulgar fractions were not nearly as fascinating as their titles might indicate.

So, what's new about the "new" math? Not very much, really. The old books didn't mention sets and their union and intersection and the format of none of the texts was very colorful. The publishers of some texts in those days did not seem to be adverse to running a few pages of commercials at the end of the text advertising some of their other publications. For example, in a book printed around 1910, the American Book Company offered a text on personal hygiene for 40 cents; a literature series for grades one through eight, each text costing amounts varying from 22 cents to 50 cents; a complete course in spelling for 20 cents; and an arithmetic book for 30 cents.

The texts at the turn of the century had plenty of story or word problems. Not very many of the problems had truly practical application in the real world of the day . . . another fact that remains unchanged today. In Samuel Hamilton's book titled *School Arithmetic,* published by The American Book Company around 1910, one can find the following problem on page 168. "A teacher's expenses are $30 a month, and this amount is 37½% of his salary. How much does he save?"

So, what's new?

Not much!

Nominating Committee Report

The following names are submitted by the nominating committee:

First Vice-President
Dr. Ida Mae Heard
Education (Elementary) Department
North Texas State University
Denton, Texas 76203

Secretary
Sister Jane Meyer
Kelly High School
5950 Kelly Drive
Beaumont, Texas 77707
(713-866-4116)

Treasurer
Dr. Floyd Vest (Re-election)

Parliamentarian
Mr. William T. (Bill) Stanford
6406 Landmark Drive
Waco, Texas 76710

Respectfully Submitted,
Loretta Hudspeth, Chairman
(Waco)
Miss Billie Jack Fairman
(Denton)
Dr. J. Chester Bryant
(Waco)

Proposed NEA Changes Threaten NCTM

By H. VERNON PRICE

(The NCTM president here adapts and interprets a report by the Information Advisory Committee)

(From Coastal Bend Council of Teachers of Mathematics Breeze, March 28, 1972)

The National Education Association is considering adopting a new constitution and bylaws that may threaten the very existence of the NCTM as we have known it. You may be able to influence the NEA decision.

Affiliation. As many of you know, the NCTM became a department of the NEA in 1950 and moved its headquarters to the NEA building in Washington at that time. As a department we had the benefit of rent-free space, special services in areas such as bookkeeping and maintenance of inventory, and the convenience of being in close physical proximity to the headquarters of other professional education associations.

For many years efforts have been made by the NEA to require that members of affiliated organizations hold membership in the NEA also. In 1968 such a requirement was enacted for NEA departments. However, a compromise was approved allowing each organization four choices: (1) to be a *department* (all members must be members of the NEA), (2) to be a *national affiliate* (elected officers must be NEA members), (3) to be an *associated organization* (no requirement for NEA membership) and (4) to be totally dissociated from the NEA. Since it was considered impossible to remain a department (option 1), the NCTM chose to become a national affiliate. This choice enabled us, by paying a modest maintenance charge, to retain our offices in the NEA building.

The Constitutional Convention ("Con Con"). When the 484 delegates to the NEA's Constitutional Convention met in Fort Collins, Colorado, 17 July — 6 August, 1971, it was voted to recommend adoption of the proposed constitution and by-laws. While many significant changes appear in these documents, those pertaining to affiliates and special-interest groups are of greatest importance to the NCTM and similar organizations. Sections 8-7*a* and 8-15*c* of the proposed bylaws require that all members of affiliated organizations be members of the NEA. Section 8-15*f* requires that affiliates "not duplicate services," and section 8-15*g* requires that affiliates "have a membership and fiscal year the same as that of the Association."

As indicated earlier, the requirement pertaining to membership would make it impossible for the NCTM to be an affiliate of the NEA. Similar problems would arise for many other professional associations.

The immediate effects of a split between the NEA and most of its affiliates probably would not be serious and would simply separate welfare activities from other professional considerations. However, other sections of the proposed NEA bylaws appear to encourage the creation of special-interest groups and affiliates in areas where there are none now or would be none in the reorganized NEA structure. *Thus in time, we could expect to see the creation of a new NEA affiliate in mathematics education.* And if the NEA and the American Federation of Teachers were to join forces (as has already been suggested to many states) and membership in an affiliate or special-interest group were automatic for members of this new organization, the professional of mathematics education would indeed be split. The result would be dissipation of efforts, smaller membership in both organizations, competitive and conflicting activities and recommendations, and general dissipation of available resources to attack the problems facing mathematics education. The problems facing mathematics education today are sufficiently great without such duplication and dissipation of efforts.

From the point of view of the NCTM and other affiliates, the most satisfactory action, and the simplest way to forestall such a consequence, would be to modify the proposed constitution and bylaws to permit continuation of the compromise adopted in 1968 allowing varying degrees of affiliation.

Suggested actions. The Constitutional Convention delegates will reconvene 24-29 March 1972 in Minneapolis. The president of each NCTM affiliated group has been sent the names of these delegates. They will also be sent to anyone requesting such a list from the Washington office. If you know any of the delegates or believe you can persuade some of them to take action to modify the proposed constitution and bylaws, you should contact such

delegates before or during the March convention.

At the NEA Representative Assembly in Atlantic City in June 1972, the proposed constitution and bylaws can be (1) modified further, (2) accepted without change, or (3) rejected. If you have an opportunity to influence the choice of delegates to the Representative Assembly, be sure to find out how the candidates from your area stand on the issue of affiliates such as ours ("nongovernance" affiliates).

Finally, between 1 November and 21 November 1972 all who are NEA members as of 31 May 1972 will have an opportunity to vote by mail ballot for acceptance or rejection of the proposed constitution and bylaws. If the sections on nongovernance affiliates are not changed so as to allow the NCTM to continue its affiliation, we would recommend that NCTM members vote for rejection of the documents and encourage others to do so as well.

Texas Delegates

Larry Yawn
3500 Winfield Dr.
Austin, Texas 78704

Dorothy Alexander
2329 Millermore
Dallas, Texas 75216

Vivian Bowser
3215 Charleston
Houston, Texas 77021

Betty Buford
3902 East 29th, #D13
Bryant, Texas 77801

Ruth Amend
3000 Gunnison Trail
Ft. Worth, Texas 76116

LaVerne B. Wong
3902 East 29th, #D13
Bryan, Texas 77801

Viola Brice
1701 Shannon
Sherman, Texas 75090

Samuel H. Kuykendall
620 S. Mesquite
San Antonio, Texas 78202

Albert F. Castro
1501 E. Filmore St.
Brownsville, Texas 78520

Clark Hitt
7042 Wakefield
Dallas, Texas 75231

NEA Board

Elizabeth Little
3701 Ft. Worth St.
Corpus Christi, Texas 78411

Manual Gonzalez
1026 Upson
El Paso, Texas 79901

The *NCTM Bulletin for Leaders* May, 1972, makes this observation: "At least one NCTM Affiliated Group has recently engaged in a postcard campaign urging its members to inform delegates to the NEA's Constitutional Convention of their opposition to the proposed section that would require NEA membership by members of NCTM and other national affiliated organizations. . . ."

Notes and Quotes

TCTM will sponsor a workshop at J. Frank Dobie High School, Pasadena Independent School District, September 16, 1972.

Note from Executive Committee of TCTM: "If you aren't going to your local council meetings or other state and national council meetings, you're the loser." Save the dates of

February 8-10, 1973 (CASMT in Austin)

April 25-28, 1973 (Houston 51st Annual Meeting)

August 22-25, 1973 (Fort Worth Area Meeting)

NEW officers for the Coastal Bend Council of Teachers of Mathematics are: MADGE SIMON, *President,* Gregory-Portland High School; GILLETTE IRBY, *First Vice-President,* Corpus Christi ISD; LILLIAN EDWARDS, *Second Vice-President,* Calk Elementary School, Corpus Christi; LEROY DE HAVEN, *Secretary,* Cullen Junior High, Corpus Christi; WARREN STRICKLAND, *Treasurer,* Mathematics Department, Del Mar College, Corpus Christi; and GERALD B. SMITH, *Editor of "Coastal Bend Breeze",* Gregory-Portland High School.

Think It Over: "A diamond is just a piece of coal that stuck to its job." How durable is the mathematics you are conveying to your students?

The Oakland County Mathematics Project

by
ALBERT P. SHULTE, *Project Director*
and
DAVID W. WELLS, *Project Coordinator*
Oakland Schools, Pontiac, Michigan

The Oakland County Mathematics Project attacked the problem of providing proper materials and proper instruction for those students of moderate to good mathematical ability who are not in the college preparatory sequence. The project was federally funded (ESEA Title III) throughout its existence, and consisted of a planning grant for the 1966-67 academic year, with operational grants from June, 1968-June, 1971.

The student population with whom the project was concerned were the students comprising roughly the 25th-55th percentile on standard tests of mathematics achievement in grades 9-12. These students were characterized as "non-college aspiring." In the typical junior high or high school, these students would include many who are taking general mathematics (but not those who are primarily remedial students), and would also include some students who are in the algebra class, but for whom that course is poorly suited.

Due to requests from local school districts in Oakland County, Michigan, Oakland Schools (the intermediate school district in that county) began to study the problem of improving mathematics programs for non-college aspiring students. At this time, federal funds for innovative programs became available. A proposal for a planning grant for the 1966-67 school year to study the situation was submitted to the U. S. Office of Education. The proposal was funded and ran from September 1, 1966-August 30, 1967.

Work During the Planning Grant

Work under the planning grant consisted of four major phases, which proceeded somewhat concurrently.

Phase I. Information was gathered about mathematical requirements for entry level jobs in industry or business, and for various career options in the military services. This information was gathered in several ways. The project was assisted by a Vocational Advisory Panel made up of individuals from Ford Motor Company, Chrysler Motors, Pontiac Division, General Motors Corporation, The United States Army, The United States Navy, The United States Air Force, and the United Auto Workers. These individuals gave considerable guidance to the project and provided much useful information about job requirements. Information was also obtained from personnel directors of representative firms in Oakland County and in the surrounding Detroit Metropolitan Area. A checklist of mathematical requirements was used in collecting this information, and descriptive information was also sought to supplement the checklist.

Phase II. The project staff collected a great deal of information about projects dealing with non-college aspiring students and collected materials designed for use with these students. These projects and materials were of considerable help in developing content outlines (Phase IV). The most outstanding projects existing at the time of the planning grant were visited. Contacts with other projects were set up by correspondence.

Phase III. An awareness of effective techniques for teaching low achievers in mathematics was created in selected teachers and coordinators in Oakland County. The awareness was created by examination of materials prepared for non-college aspiring students in other school districts, by viewing pertinent films, and by bringing in consultants with recognized expertise in the area of teaching mathematics to non-college aspiring students. The effect of this was to create a group of teachers and coordinators who were convinced that non-college aspiring students could learn significant mathematics concepts, if these were properly presented, and who were willing to support efforts to improve instruction for these students in their own districts.

Phase IV. The last few sessions of the 1966-67 year were devoted to developing a content outline for a four-year sequence of mathematics courses for non-college aspiring students in grades 9-12. This outline was supplemented in some areas by more detailed work. In the Final Report of the planning grant, suggested unit outlines were written for several of the topics included in the content outline.

In addition to the Vocational Advisory Panel, the project also had an Academic Advisory Panel consisting of noted mathematics educators representing the major universities in Michigan as well as the public schools in Oakland County area. These advisors contributed many useful ideas to the project.

As the planning period went on, it was apparent that if any major effect were to take place in the schools, materials would be needed. Consequently, an operational proposal was written. This proposal was funded on its second submission (after revision of the initial proposal and inclusion of more details

of the work under the planning grant). The funded period for the operational grant was June 1, 1968-June 30, 1971.

Goals of the Operational Grant

There were five major goals during the operational grant period. These were: (1) to develop written materials (pupil books and teacher's guides), written around particular topics and designed to achieve particular behavioral objectives; (2) to develop visual and manipulative aids to be used with the written materials as part of the total learning package; (3) to field test the materials in pilot classes and to revise the materials on the basis of this field testing; (4) to provide inservice training for project teachers; (5) to evaluate the results carefully using statistical and informal means.

Operational Details

The Project Director recruited a staff of writers using the following criteria: interest in non-college aspiring students; successful experience in teaching non-college aspiring students; creativity. Writing experience was regarded as desirable but not necessary — it was hoped that given the background, interest and ideas, writing ability could be developed. This proved to be the case — project writers became highly capable in a relatively short time.

The project actually got well under way in September, 1968. The next few months were devoted to developing a booklet outline, with content and behavioral objectives, for the ninth grade sequence. The staff then began to write sample lessons, which were revised and served as the basis for the ninth grade booklets. Inservice sessions began in February, 1969, and teachers in 18 school districts began to use the booklets in late February. Four ninth grade booklets were field tested in the spring of 1969.

During the summer of 1969, revisions were begun on ninth grade booklets previously field tested. The staff as a whole also wrote objectives and content outlines for grades 10-12, and divided the material into booklets.

During 1969-70, the entire ninth grade sequence and several tenth grade booklets were field tested. During 1970-71, the ninth grade sequence was field tested again, on a much larger scale, and the entire tenth grade sequence was field tested.

Some information about the project is provided in the table below.

SOME BASIC STATISTICS

	1968-69	1969-70	1970-71
Districts	18	20	21
Teachers	25	38	93
Classes	33	53	156
Students	950	1400	4500
Inservice Sessions	10	18	18

Inservice sessions on using each booklet in the classroom were planned by the author of the booklet under consideration. Early in the project, the total responsibility for inservice sessions was shared among the project staff. During 1970-71, two departures from this were made. To reduce the amount of staff time devoted to inservice training, successful project teachers were involved as teachers in many sessions. In addition, two sessions were devoted to special topics and featured outside consultants. These were a demonstration session on using laboratory activities and a session on leading effective discussions.

In the inservice sessions, some time was spent on new content, but the major emphasis was on the strategies of presenting the materials to the students. A large part of the material was activity-oriented; teachers carried out these activities in much the same way that it was hoped their students would perform them. Much of the work in inservice sessions took place in small groups allowing for more effective interaction.

Some of the most important characteristics of the materials developed by the project are:

1) A sequential and spiral development of the mathematical ideas. The booklets are organized around the following seven content strands: Algebra; Geometry; Trigonometry; Measurement; Computation; Probability and Statistics; Critical Thinking and Problem Solving. These strands begin at different times, but once they begin they are spiraled from that time on.

2) The format is that of small booklets, which take roughly 2-5 weeks in teaching time. This provides more feeling of accomplishment for a low achieving student and helps to reduce boredom due to studying the same topic too long.

3) Student involvement. Roughly one-third of the lessons involve the student in a laboratory activity (something more than just pencil and paper activity). Many of the lessons are designed so that the students work in small groups.

4) As previously mentioned, the visual, manipulative and written materials have been developed as a total learning package.

5) Behavioral (or performance) objectives have been used as the basis for writing the booklets. These objectives are set forth in the teacher's guides, and booklet tests are designed to measure the extent to which these objectives have been achieved.

During the project, staff members made many presentations to groups concerned with improving mathematics programs for the low achiever. These included presentations at several conferences of the National Council of Teachers of Mathematics and the Michigan Council of Teachers of Mathematics as well as The University of Michigan Mathematics Education Conference, just to name a few.

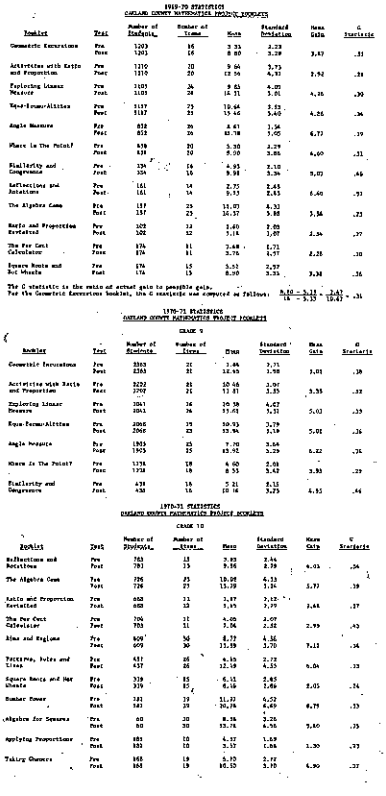
Evaluation and feedback were handled in a variety of ways. Statistical information was gathered by using a pre-test and post-test on each booklet. In addition, each student answered (on a machine-scored answer sheet) questions on each booklet, including such things as its readability, how much the student learned, whether he liked the booklet, and the difficulty of the exercises.

Information on the booklets and their strong and weak points were obtained by: classroom visitation to see teachers and students in action; feedback sessions (a portion of each inservice session) where

teachers could express their opinions verbally; teachers returning teacher's guides with comments written in.

At the end of the funding period, one eleventh grade booklet had been written in addition to the entire ninth and tenth grade sequence. Field testing of eleventh grade materials as they are prepared by the Oakland Schools staff will be undertaken by two school districts.

The titles of the booklets prepared as a part of the project are: Geometric Excursions; Activities with Ratio and Proportion; Exploring Linear Measure; Equa-Formu-Alities; Angle Measure; Where Is the Point?; Similarity and Congruence; Reflections and Rotations; The Algebra Game; Ratio and Proportion Revisited; The Per Cent Calculator; Rims and Regions; Patterns, Rules and Lines; Square Roots and Hot Wheels; Algebra III; Applying Proportions; Taking Chances; Circular World.



1969-70 STATISTICS
OAKLAND COUNTY MATHEMATICS PROJECT BOOKLETS

Booklet	Test	Number of Students	Number of Items	Mean	Standard Deviation	Mean Gain	C Statistic
Geometric Excursions	Pre	1203	16	3.33	2.23		
	Post	1203	16	8.80	3.28	3.47	.31
Activities with Ratio and Proportion	Pre	1210	20	9.64	5.73		
	Post	1210	20	13.56	4.91	3.92	.34
Exploring Linear Measure	Pre	1183	24	8.83	4.20		
	Post	1183	24	14.31	5.01	4.26	.30
Equa-Formu-Alities	Pre	1137	23	10.64	5.23		
	Post	1137	23	15.46	5.40	4.26	.36
Angle Measure	Pre	838	39	8.41	3.34		
	Post	838	39	15.78	5.05	6.77	.39
Where Is the Point?	Pre	638	30	5.30	2.29		
	Post	638	30	9.90	3.86	4.60	.31
Similarity and Congruence	Pre	334	16	4.63	2.10		
	Post	334	16	9.98	3.34	5.35	.46
Reflections and Rotations	Pre	161	14	2.75	2.45		
	Post	161	14	9.53	2.63	6.40	.91
The Algebra Game	Pre	157	23	11.47	4.32		
	Post	157	23	16.57	3.88	5.34	.23
Ratio and Proportion Revisited	Pre	102	12	3.40	2.88		
	Post	102	12	7.14	2.07	2.34	.37
The Per Cent Calculator	Pre	174	11	3.48	1.71		
	Post	174	11	5.76	1.97	2.28	.30
Square Roots and Hot Wheels	Pre	174	15	5.53	2.97		
	Post	174	15	8.09	3.05	2.56	.26

The C statistic is the ratio of actual gain to possible gain.
For the Geometric Excursions booklet, the C statistic was computed as follows: $\frac{3.47 - 3.33}{16 - 3.33} = \frac{.147}{12.67} = .01$

1970-71 STATISTICS
OAKLAND COUNTY MATHEMATICS PROJECT BOOKLETS

GRADE 9

Booklet	Test	Number of Students	Number of Items	Mean	Standard Deviation	Mean Gain	C Statistic
Geometric Excursions	Pre	3363	21	7.44	3.71		
	Post	3363	21	12.45	3.98	5.01	.38
Activities with Ratio and Proportion	Pre	3232	21	10.46	3.97		
	Post	3232	21	13.81	3.25	3.35	.33
Exploring Linear Measure	Pre	3041	24	10.59	4.47		
	Post	3041	24	15.61	5.31	5.02	.33
Equa-Formu-Alities	Pre	2905	23	10.93	3.79		
	Post	2905	23	15.94	3.19	5.01	.36
Angle Measure	Pre	1903	25	7.70	3.64		
	Post	1903	25	13.92	3.29	6.22	.35
Where Is The Point?	Pre	1731	18	6.60	2.68		
	Post	1731	18	8.53	3.42	3.93	.29
Similarity and Congruence	Pre	438	16	5.21	2.15		
	Post	438	16	10.16	3.25	4.95	.44

1970-71 STATISTICS
OAKLAND COUNTY MATHEMATICS PROJECT BOOKLETS

GRADE 10

Booklet	Test	Number of Students	Number of Items	Mean	Standard Deviation	Mean Gain	C Statistic
Reflections and Rotations	Pre	783	15	3.82	2.44		
	Post	783	15	9.86	2.89	6.03	.56
The Algebra Game	Pre	496	25	10.96	4.13		
	Post	726	25	15.10	3.84	3.73	.39
Ratio and Proportion Revisited	Pre	668	13	3.87	2.63		
	Post	668	13	7.35	2.79	3.48	.37
The Per Cent Calculator	Pre	706	11	4.00	2.07		
	Post	703	11	7.06	2.02	2.99	.43
Rims and Regions	Pre	609	30	8.72	4.36		
	Post	609	30	21.89	3.70	7.13	.36
Patterns, Rules and Lines	Pre	437	26	6.10	2.72		
	Post	437	26	12.18	4.25	6.04	.33
Square Roots and Hot Wheels	Pre	339	15	6.15	2.65		
	Post	339	15	8.16	1.86	2.01	.14
Number Power	Pre	181	19	11.22	4.03		
	Post	181	19	20.28	4.60	8.79	.33
Algebra for Seniors	Pre	60	30	8.36	3.25		
	Post	60	30	15.76	4.46	7.40	.25
Applying Proportions	Pre	183	10	4.37	1.69		
	Post	183	10	7.57	1.84	3.20	.32
Taking Chances	Pre	165	19	5.10	2.72		
	Post	165	19	10.10	3.10	4.90	.27

Present Status of the Project

Since the federal funding has run out, the project is being continued only at a rather low level. Mathematics Department Staff Members of Oakland Schools have as a part of their responsibilities the development of eleventh and twelfth grade units over the next several years. These units will be field tested as they become available.

Project materials for the ninth and tenth grade are available for purchase from The McKay Press, Inc., P. O. Box 408, Midland, Michigan 48640. A price list is available on request.

Information about specific details of the project and the content of each booklet may be obtained by writing Dr. Albert P. Shulte, Oakland Schools, 2100 Pontiac Lake Road, Pontiac, Michigan 48054.

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1960	180	50
1970	200	55
1980	225	62
1990	254	70
2000	286	79
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