AN INVESTIGATION OF TWO APPROACHES IN TEACHING ELEMENTARY ALGEBRA

by

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LIST OF TABLES

ABSTRACT

The purpose of this investigation was to determine if 10th grade students with a 9th grade general mathematics background would score significantly greater gain if taught elementary algebra with SMSG materials than if taught with conventional material.

Students were assigned randomly to a control group and an experimental group. The control group was instructed with traditional materials and by traditional methods. The experimental group was exposed to SMSG materials and methods. Comparison of the two groups was made on the basis of students' t-scores.

Conclusions reached as a result of the investigation were that SMSG materials and methods were not superior to traditional methods in teaching this particular group. No specific method showed superiority in teaching specific topics of algebra. Neither method produced a significantly greater gain than the other method.

Recommendations made as a result of this investigation were: (1) That more research should be done on the effectiveness of modern algebra in teaching the low achiever. (2) That school authorities should study available experimental evidence closely before implementing a new mathematics program. (3) That teachers be encouraged to update their preparation in mathematics. (4) That more inservice programs in mathematics are needed. (5) That the results of significant research should be readily available to all schools.

CHAPTER I

INTRODUCTION

During the first half of the twentieth century few significant changes were made in the secondary mathematics curriculum either in content or method according to Henkelman (1963). However, during this same period, the field of mathematics has been undergoing a rapid change. Price (1961) has referred to this rapid change in the field of mathematics as "The Revolution in Mathematics." Speaking of this change, he said:

> The twentieth century has been the golden age of mathematics, since more mathematics, and more profound mathematics, has been created during this period than in all the rest of history.

This rapid advance in mathematics has caused an ever widening gap between it and past secondary mathematics programs, consequently creating many problems.

Educators are aware that these problems exist. Many secondary schools have implemented new mathematics programs and many more have considered doing so. Unfortunately, many of these programs have been placed in operation with insufficient preparation and planning.

Henkelman (1963) suggests that before starting a new program the following points first be considered:

1. That the need for a new mathematics program must be recognized by the school authorities.

2. That the teachers should have adequate preparation in the materials to be used in the program.

3. That experimental evidence concerning new programs be studied before selecting a program.

The administrator considering a new mathematics program should have evidence upon which to base his decisions. William and Shuff (1963) found an extreme lack of experimental evidence upon which to base decisions. Too often these decisions, hurried by pressures from various groups and individuals, are based on opinions rather than evidence. Frequently, these opinions have come from teachers who have had experience with new approaches to the teaching of mathematics. Most of these teachers are enthusiastic about the new programs. However, there is need of experimental evidence at all levels of mathematics to support or reject these opinions.

Selecting the right program will depend to a great extent upon the amount of research done, how well this research is done, and how accurate and valid the interpretation of the results.

STATEMENT OF THE PROBLEM

The purpose of this investigation is to make a comparison of the modern with the traditional approach, and its overall affect, in teaching elementary algebra to students who have previously had a course in general mathematics.

Specifically, this study will consider the following questions:

1. Are SMSG materials superior to traditional materials in teaching the less able student?

2. In what specific topics of algebra is the inductive method superior to the deductive method in teaching these students?

3. Which method will produce the most overall gain in achievement?

4. Does SMSG teach some unique concepts that are of particular value to secondary students?

5. If these unique concepts exist, can they be measured by available commercial tests?

DEFINITIONS

Terms used in this research will be defined in the following manner:

Modern mathematics. Those materials and approaches developed within the past decade and generally inductive in nature. Specifically SMSG material.

Traditional mathematics. Mathematics as taught during the first half of the century. Generally of a deductive nature.

SMSG. School Mathematics Study Group. Refers to the material and methods developed by this group.

Deductive. Solving specific problems by the use of previously stated generalizations.

Inductive. Arriving at mathematical generalizations through specific illustrations. This is the basis for most of the approaches that are known as the discovery approach.

CHAPTER II

REVIEW OF RELATED LITERATURE

Much of the research related to the new mathematics programs is being done by beginners in the field of research. According to Brown (1960) much of this research is poorly done. To improve research and make it more effective he suggests the following:

1. The need of adequate supervision for the beginner in research.
2. That supervisors of the beginner in research need be more critical of the design, procedure, and findings of the study.
3. That significant problems need to be identified.
4. The results of each research should be clearly and completely reported.
5. Statistical treatment of data must be adequate to the research.
6. That significant studies should be widely published.

Library research was done seeking related literature. Very little published literature was found that dealt with a similar population. Of those found, three were abstracts and therefore the investigator could not study the full reports.

Easterday (1964) conducted a research study to determine if modern mathematics could be taught effectively to low achievers and to determine if reasoning and/or fundamentals could be significantly increased.

This study involved 37 eighth-grade students and 41 seventh-grade students. Of the total group, 49 were boys and 29 were girls, with the ratio of boys to girls approximately equal in both grade levels. Both groups were given instruction by the same teacher. The conclusions reached were based on results of achievement tests given at the end of the year.

The results as indicated by the achievement tests showed a median growth in reasoning of 1.04 and a median growth in fundamentals of 1.32. Maximum individual growth in reasoning was three years and maximum growth in fundamentals was four years.

Easterday (1964) included the following conclusions and recommendations:

1. Modern mathematics can be blended with traditional materials into a successful subject matter program.

2. Small group instruction with independent study is possible in a classroom of thirty students. The result of the experiment indicates a class size of twenty or less students is desirable.

3. The basic principles of the non-graded elementary school can be applied effectively to low achievers in the secondary school.

4. The program described is more effective for eighth-grade students with IQ's below 100 and seventh-grade students with IQ's above 100.

5. Such a program may be effective in increasing a low achiever's grade level in mathematics up to as much as three years while class medians may be expected to increase at a normal rate.

6. Such a program may be effective in increasing a student's level of arithmetic reasoning up to as much as three years, and competency in fundamentals up to as much as four years.

The conclusions to this study indicate that further study might be helpful in developing a suitable mathematics program for low achievers at this level.

Hamilton (1960) conducted a study to compare the achievement of students in traditional and contemporary algebra.

Sections of contemporary algebra 1 were compared with sections of traditional algebra 1 by means of pretests and post-tests.

Conclusions were that there was increased enthusiasn of students in the contemporary sections with no loss of achievement in the contemporary sections on traditional materials.

Malan (1960) made a research study with a recently developed test for ninth-grade mathematics. The problem in this research was to answer these two questions: (1) did the achievement on traditional mathematics made by students who studied a new curriculum in ninth-grade mathematics compare favorably with the achievement of students who were taught by traditional methods and materials in the same school? (2) did the new material stimulate a greater degree of apparent interest as shown by increased enrollment in elective second-year mathematics courses?

The experimental group consisted of four classes, two taught by each of two teachers throughout the 1959-1960 school year, using the materials of the Development Project in Secondary Mathematics developed by Southern Illinois University. The control group consisted of two classes taught by another teacher using traditional materials. Students were assigned randomly to the six classes. Arithmetic scores on the California Arithmetic Test were obtained as pretest scores. Otis Quick Scoring Test scores were obtained. The criterion of ninth-grade achievement was performance on the Lankton Algebra test, given near the close of the year.

Major conclusions were that the students in the experimental group achieved significantly higher on the standardized algebra test than did the students in the control group. In the experimental group 75 per cent indicated at the end of the year they they intended continuing with second-year mathematics, while only 34 per cent of the control group planned to continue.

Payette (1961) made a report on curriculum evaluation of the School Mathematics Study Group.

The purpose of the study was to answer the following questions: (1) Does the SMSG curriculum detract from student achievement with respect to traditional mathematics skill? (2) Does the SMSG curriculum result in a measurable extension of mathematic ability beyond that of conventional mathematics instruction? (3) How effective is the SMSG Curriculum communicated to students at various levels of scholastic ability?

Evidence pertinent to the first question was secured in the following way: A group of teachers (CA), Selected at random from a group of teachers willing to teach the SMSG curriculum for the first time, provided their students with conventional mathematics instruction. A second group of teachers (EA), selected at random from a group of teachers willing to teach SMSG curriculum for the first time, provided their student with mathematics instruction based on SMSG materials. There were approximately thirty teachers in each of the two groups CA and EA, at each of five grade levels, 7-12.

Students of CA teachers and students of EA teachers were administered common tests of scholastic aptitude and knowledge of mathematics in the Fall of 1960, and a common of traditional mathematics and SMSG mathematics in the Spring of 1961. The tests were designed for the various grade levels and curriculum involved in the study.

Evidence relative to the second question was secured in the following manner: The students of CA teachers were compared with the students of EA teachers on the basis of their performance on SMSG tests.

Data relevant to the third question was derived by plotting SMSG test score distributions according to differing SCAT levels. Then, overlap among SMSG test scores was sought for students of high, medium, and low scholastic ability.

An additional facet of this study was the concern for results that might be attributable to Hawthorne or experimental effect. In order to establish some control over the influence that participating in an experiment is alleged to exert on experimental results, an additional comparison of traditional mathematics achievement was made.

A group of mathematics teachers (CC) was randomly selected from the large school systems who participated in the study. Their participation included only the administration of SCAT and achievement tests of conventional and SMSG mathematics in the Spring of 1961. These teachers did not know that they would be asked to participate in the study until shortly before the Spring administration of tests. Hence it is hypothesized that their instruction was not influenced by knowing that they were in an experiment.

Major findings and conclusions were as follows: In general, students exposed to conventional mathematics have neither a pronounced nor a consistent advantage over students exposed to SMSG mathematics with respect to the learning of traditional mathematics skills.

Students exposed to SMSG instruction acquire pronounced and consistent extensions of developed mathematical abilities beyond that developed by students exposed to conventional mathematics instruction.

Regarding the Hawthorne effect, comparisons of achievement on conventional and SMSG tests for students of CA and CC teachers indicated unequivocally that there is no advantage in favor of students of CA teachers, those teachers who knew they were in an experiment. The CC teachers provided instruction in conventional mathematics only.

Scholastic aptitude is far from the whole story in predicting achievement in SMSG. The necessity for additional predictors of SMSG achievement becomes particularly acute in the upper grades. Additionally, the large range of achievement scores for all SCAT levels at all grade levels cast doubt on traditional means of selecting students for ability grouping in mathematical instruction. Finally, there is positive evidence to suggest that students at all SCAT levels can learn considerable segments of SMSG materials.

Since this research involved a large population and the research was done by a professional group of test researches it seems likely that the results are valid.

Williams (1963) made a comprehensive study comparing SMSG and traditional mathematics. One phase of this study involved two algebra I groups. Two groups of ninth-grade students were chosen by random selection. The control group consisted of 31 students who were given a course in traditional mathematics. The experimental group consisted of 33 students who were taught by the SMSG material.

The Differential Aptitude Test (DAT) in Verbal Reasoning (VR) and Numerical Ability (NA) to all students in both groups for comparing the abilities of the involved students in the study, and for selecting subsambles or subgroups. The Sequential Tests of Educational Progress in mathematics to measure achievement and mathematical growth. Form was used as a pretest and form 2B as post-test. The COOP Elementary Algebra was also used for measuring algebraic skills, applications, and concepts. Form T was used as a pretest and form Y as a post-test.

Assuming equality of the two groups because of method of selection, students' t-distribution was selected as the statistical treatment to be applied to the means obtained by the classes on different tests. The Cochrane-Cox test was used to check the t when observed deviations were not equal.

The question under investigation was whether ninth-grade students would differ significantly in achievement in elementary algebra if taught with SMSG material rather than traditional material.

The two classes made practically the same mean gain on the STEP mathematics tests, but the class taught with traditional materials made somewhat larger gain on the COOP Elementary Algebra Test. The class taught with SMSG materials had a smaller standard deviation of scores on the STEP post-test than on the STEP pretest, while the class taught with traditional text materials had a somewhat larger standard deviation of scores on the post-test. On the COOP Elementary Algebra Test both classes had larger standard deviation of test scores on the post-tests than on the pretests.

The t-test significance showed that the t-ratio was largest for the DAT battery but still nonsignificant. The difference between means on the test was in the direction of the group taught with SMSG text materials as it was for the STEP pretest, the STEP post-test, and the COOP pretest. In contrast, the derived t for the COOP post-test was in the direction of the group taught with traditional text materials.

The t-tests seem to indicate that the small differences in means could be attributed to chance.

The chapter which follows contains a thorough discussion of the research methods used in investigating the problem under consideration.

CHAPTER III

METHODS

The methods used in research will depend largely upon the kind of problem being investigated. Experimental research was chosen as the most applicable to the particular problem under consideration.

DESIGN OF THE EXPERIMENT

The pretest post-test control group design was used in this experiment. One teacher was used for both the experimental and control group. By using the same teacher for both groups the teacher influence factor could be held to a minimum, although it was recognized that the results could be modified by teacher preference.

POPULATION INVOLVED IN THE EXPERIMENT

This experiment involved 45 students enrolled in Lincoln County High School, Eureka, Montana, during the 1966-67 school year. All of the students taking part in this experiment were tenth-grade students who had completed a course in general mathematics the year before. Random selection by tossing a coin was used to assign the students to the groups. One group was designated the control (Y) group and was given instruction in traditional mathematics. The other group was designated the experimental (X) group and was given instruction in SMSG mathematics. The control (Y) group contained 25 members and experimental (X) group 20.

INSTRUMENTS USED FOR GATHERING DATA

The Differential Aptitude Tests (DAT) in Verbal Reasoning (VR) and

Numerical Ability (NA) was administered to all students in both groups for comparing abilities. The Cooperative Elementary Algebra Tests (COOP) was administered to measure gain in algebraic skills, achievement, and growth in understanding. Form X was used as a pretest and form Y as a post-test.

TREATMENT OF DATA

The pretest-post-test control group design was used in this experiment. Equality of the two groups was assumed as random selection was used in determining which group any particular student would be a member of. For comparison purposes, students' t-distribution was chosen as the statistical treatment for the test of significance at the 5% level.

Comparison of the two groups was made on the basis of the significance of differences between two means as suggested by Lacey (1953). These were arrived at in the following manner:

Standard Deviation (s) $= \sqrt{\frac{\Sigma x^2 + \Sigma y^2}{n_1 + n_2 - 2}}$

The standard deviation of the Y group = $s_{\bar{Y}} = \frac{s}{\sqrt{n_1}}$

The standard deviation of the means of the X group = $s_{\bar{X}} = \frac{s}{\sqrt{n_2}}$

The standard deviation of the differences between the means = $s_{\bar{D}}$ =

$\sqrt{s_{\bar{Y}}^2 + s_{\bar{X}}^2}$ and $t = \frac{\bar{D}_1 - D_2}{s_{\bar{D}}}$

A comparison of the control group with the experimental group on the basis of the results of the Cooperative Elementary Algebra pretest again showed very little difference between the two groups. This data is shown in Table II.

TABLE II. RESULTS OF COOPERATIVE ELEMENTARY ALGEBRA PRETEST.

Control (Y)	Deviation (y)	Deviation Squared (y^2)	Experi-mental (X)	Deviation (x)	Deviation Squared (x^2)
14	7.2	51.84	16	8.4	70.56
11	4.2	17.64	13	5.4	29.16
10	3.2	10.24	12	4.4	19.36
10	3.2	10.24	11	3.4	11.56
9	2.2	4.84	10	2.4	5.76
9	2.2	4.84	10	2.4	5.76
9	2.2	4.84	9	1.4	1.96
8	1.2	1.44	8	0.4	0.16
8	1.2	1.44	8	0.4	0.16
8	1.2	1.44	8	0.4	0.16
8	1.2	1.44	8	0.4	0.16
7	0.2	0.04	7	-0.6	0.36
7	0.2	0.04	6	-1.6	2.56
7	0.2	0.04	6	-1.6	2.56
6	-0.8	0.64	5	-2.6	6.76
6	-0.8	0.64	4	-3.6	12.96
5	-1.8	3.24	4	-3.6	12.96
5	-1.8	3.24	3	-4.6	21.16
5	-1.8	3.24	2	-5.6	31.36
5	-1.8	3.24	2	-5.6	31.36
4	-2.8	7.84			
4	-2.8	7.84			
2	-4.8	23.04			
2	-4.8	23.04			
1	-5.8	33.64			
Totals 170					
Means (D_1) 6.8	0.0	220.00	152	0.0	266.80
$n_1 = 25$			(D_2) 7.6		
			$n_2 = 20$		

Standard Deviation (s) $= \sqrt{\dfrac{220.0 + 266.8}{43}} = \sqrt{11.37} = 3.37$

$s_{\bar{Y}} = \dfrac{3.35}{\sqrt{25}} = .670$ $\qquad s_{\bar{X}} = \dfrac{3.35}{\sqrt{20}} = .7404$

$s_{\bar{D}} = \sqrt{(.670)^2 + (.740)^2} = \sqrt{.9965} = .998$

$t = \dfrac{7.6 - 6.8}{.998} = .6012$

The calculated value of t was 0.6012 which is well below the value of 2.025 which is needed for significance at the 0.05 level of probability. The control group had a median of 7 and a mean of 6.8 while the experimental group had a median of 8 and a mean of 7.6. The range between low and high was 13 for the control group and 14 for the experimental. This indicates that both groups were comparable on the basis of range of abilities.

The results of the Cooperative Elementary Algebra Post-test is shown in Table III on the following page. Again the two groups were very similar on the basis of the test. The data showed a greater range between low and high in both groups with 24 for the control group and 23 for the experimental. Although the results as tabulated does not state that the students were in the same relative position, it is probable that the lowest 20% made the least gain. Evidently a few made very little gain. The mean for the control group was 12.2 and for the experimental group was 13.8. (This was a greater difference than on either of the other two tests). The calculated value for t was 0.9147 which was greater than the value in either of the other tests but still well below any significant value.

For 45 degrees of freedom a tabled value of t equal to 2.025 is needed for significance at the 0.05 level of probability. The t-ratios of this experiment ranged in value from a low of 0.2016 on the DAT to a high of 0.9147 on the COOP post-test. None of the t-ratios were significant by this method of interpretation.

Table IV on page 17 shows that the experimental group made the

TABLE III. RESULTS OF COOPERATIVE ELEMENTARY ALGEBRA POST-TEST.

Control (Y)	Deviation (y)	Deviation Squared (y^2)	Experimental (X)	Deviation (x)	Deviation Squared (x^2)
27	14.8	219.04	29	15.2	231.04
23	10.8	116.64	25	11.2	125.44
19	6.8	46.24	21	7.2	51.84
16	3.8	14.44	17	3.2	10.24
15	2.8	7.84	15	1.2	1.44
14	1.8	3.24	15	1.2	1.44
14	1.8	3.24	15	1.2	1.44
14	1.8	3.24	13	-0.8	0.64
14	1.8	3.24	13	-0.8	0.64
13	0.8	0.64	13	-0.8	0.64
12	-0.2	0.04	12	-1.8	3.24
12	-0.2	0.04	12	-1.8	3.24
12	-0.2	0.04	12	-1.8	3.24
12	-0.2	0.04	11	-2.8	7.84
11	-1.2	1.44	11	-2.8	7.84
10	-2.2	4.84	10	-3.8	14.44
10	-2.2	4.84	9	-4.8	23.04
10	-2.2	4.84	9	-4.8	23.04
9	-3.2	10.24	8	-5.8	33.64
9	-3.2	10.24	6	-7.8	60.84
8	-4.2	17.64			
7	-5.2	27.04			
6	-6.2	38.44			
5	-7.2	51.84			
3	-9.2	84.64			
Totals 305	0.0	674.00	276	0.0	605.20
Means (D_1) 12.2			(D_2) 13.8		

Standard Deviation (s) $= \sqrt{\dfrac{674.0 + 605.2}{43}} = \sqrt{29.75} = 5.45$

$s_{\bar{Y}} = \dfrac{5.45}{\sqrt{25}} = 1.09$ $\qquad s_{\bar{X}} = \dfrac{5.45}{\sqrt{20}} = 1.22$

$s_{\bar{D}} = \sqrt{(1.09)^2 + (1.22)^2} = \sqrt{2.6765} = 1.64$

$t = \dfrac{13.8 - 12.2}{1.64} = \dfrac{1.6}{1.64} = .9147$

TABLE IV. ANALYSIS OF PRETEST AND POST-TEST SCORES.

Control Group (Y)				Experimental Group (X)			
Test	Mean	$s_{\bar{Y}}$	s	Mean	$s_{\bar{X}}$	$s_{\bar{D}}$	t-Ratio
DAT, VR & NA	35.8	1.65	8.25	36.1	1.85	2.58	0.2016
COOP Form (X)	6.8	0.67	3.37	7.60	0.75	0.998	0.6012
COOP Form (Y)	12.2	1.09	5.45	13.8	1.22	1.64	0.9147
Gain	5.4		6.2				

For 45 degrees of freedom a tabled value of t equal to 2.025 is needed for significance at the 0.05 level of probability.

largest mean gain. However, this gain is not large enough to indicate that it is the result of the materials used or the method in which they were presented.

SUMMARY OF RESULTS

An analysis of the results of the Differential Aptitude Test showed that the two groups are quite similar in ability with a difference in means of only 0.5. The calculated t-ratio of 0.2016 was the lowest of the three tests.

The COOP pretest also indicated that the two groups were quite similar with a difference in means of only 0.8. The calculated t-ratio was 0.6012.

The greatest difference between the two groups appeared in the COOP post-test. The difference between the means was 1.6 on this test. The calculated t-ratio of 0.9147 was the highest of the tests but still well below a significant value at the 0.05 level of probability.

CHAPTER V

RESULTS

The Differential Aptitude Test results are presented in Table I.

TABLE I. RESULTS OF THE DIFFERENTIAL APTITUDE TEST, VR AND NA.

Control (Y)	Deviation (y)	Deviation Squared (y^2)	Experi-mental (X)	Deviation (x)	Deviation Squared (x^2)
53	17.4	302.76	56	19.9	396.01
48	12.4	153.76	50	13.9	193.21
42	6.4	40.96	43	6.9	47.61
41	5.4	29.16	42	5.9	34.81
40	4.4	19.36	41	4.9	24.01
40	4.4	19.36	40	3.9	15.21
39	3.4	11.56	39	2.9	8.41
38	2.4	5.76	39	2.9	8.41
38	2.4	5.76	38	1.9	3.61
37	1.4	1.96	37	0.9	0.81
37	1.4	1.96	36	-0.1	0.01
37	1.4	1.96	36	-0.1	0.01
36	0.4	0.16	36	-0.1	0.01
36	0.4	0.16	35	-1.1	1.21
36	0.4	0.16	33	-3.1	9.61
36	0.4	0.16	29	-7.1	50.41
34	-1.6	2.56	27	-9.1	82.81
34	-1.6	2.56	24	-12.1	146.41
33	-2.6	6.76	21	-15.1	228.01
33	-2.6	6.76	20	-16.1	259.21
31	-4.6	21.16			
28	-7.6	57.76			
24	-11.6	134.56			
22	-13.6	184.96			
17	-18.6	345.96			
Totals 890	0.0	1358.00	722	0.0	1569.80
Means (D_1) 35.6			D_2 36.1		

$n_1 = 25$ $\qquad$ $n_2 = 20$

$$\text{Standard Deviation (s)} = \sqrt{\frac{1358.0 + 1569.80}{43}} = \sqrt{68.09} = 8.25$$

$$s_{\bar{Y}} = \frac{8.25}{\sqrt{25}} = 1.65 \qquad s_{\bar{X}} = \frac{8.25}{\sqrt{20}} = 1.85$$

$$s_{\bar{D}} = \sqrt{(1.65)^2 + (1.85)^2} = \sqrt{6.145} = 2.48$$

$$t = \frac{36.1 - 35.6}{2.48} = .2016$$

These were used to compare the ability of the two groups. As shown in the table, these two groups were quite similar in ability. The median of both groups is 36. The mean of the control group is 35.6 while the experimental group had a slightly higher mean of 36.1. The range between high and low scores for both groups was 36, although both the high and the low of the experimental group was higher respectively than the control group.

The standard (s) was arrived at as being the square root of the quotient obtained by dividing the sums of the squared deviations by the degree of freedom. The degree of freedom was taken as two less than the sum of the members of the groups.

The standard deviation of the means of the samples of the first, or control group ($s_{\bar{Y}}$) was calculated as the quotient of the standard deviation and the size of the group. $S_{\bar{X}}$ was calculated in the same manner. The standard deviation of the differences between the means was arrived at by taking the square root of the sums of $s_{\bar{Y}}^2$ and $s_{\bar{X}}^2$. The value for t is the difference of the means divided by the standard deviation of the differences between the means. The t-ratio of the DAT was calculated as 0.6012.

The following chapter will give a summary of the experiment, conclusions resulting from research and recommendations as a result of this experiment.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This experiment was conducted to make a comparison of the modern with the traditional approach, and its overall affect, in teaching elementary algebra to students who have previously had a course in general mathematics.

The experiment involved two groups of 10th grade students at Lincoln County High School, Eureka, Montana, during the 1966-67 school year. The control group of 25 students was given instruction in traditional mathematics while the experimental group of 20 students was given instruction in SMSG materials. The members of the groups were selected randomly from students who had completed a course in general mathematics the previous year. The experiment used the pretest post-test control group design with comparison made on a basis of students' t-distribution.

CONCLUSIONS

The experimental group showed a somewhat larger overall gain but still well below the value needed for significance at the 0.05 level of probability. The experimental group also made a slightly larger mean gain. The t-tests seemed to indicate that the small differences could be attributed to chance.

The results of specific questions was as follows:

1. The results of the experiment did not indicate that SMSG materials are superior to traditional materials in teaching the less able student.

2. On the basis of the tests given no specific method showed superiority in teaching specific topics of algebra to these particular groups of students.

3. Neither method produced a significant overall gain on the basis of tests.

4. No criteria was found for determining if SMSG teaches any unique concepts that are of particular value to secondary students.

5. The tests given did not measure any concepts other than those involved in traditional mathematics.

RECOMMENDATIONS

The following recommendations are made as a result of this experiment:

1. That more research should be done on the effectiveness of modern mathematics in teaching elementary algebra to the low achiever.

2. That the secondary school authorities should study the results of experimental evidence closely before implementing a new mathematics program.

3. That teachers be encouraged to update their preparation in mathematics.

4. That inservice programs in mathematics be conducted in the modern mathematics field.

5. That the results of experiments should be readily available to all schools.

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