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AUTHOR	Shulte, Albert P.
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ABSTRACT

Outlined is a mathematics project funded by the U.S. Office of Education for students in grades 9-12 who are in the 25th to 55th percentile range of mathematics ability. Presented are the philosophy of the project, the objectives, special features of the project materials, major mathematics covered and the materials developed to teach these topics, general student reaction, results of 1969-70 field testing, and the address of the project director. The mathematics in the project is spirally presented, students learn by active participation a substantial amount of mathematics, and the results of the field testing are promising. This work was prepared under an ESEA Title III contract. (Author/CT)

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THE OAKLAND COUNTY MATHEMATICS PROJECT

PURPOSE:

To develop a four-year mathematics sequence for non-college aspiring students in grades 9-12.

PHILOSOPHY:

1) Non-college aspiring students can learn substantial amounts of important conceptually-oriented mathematics if the mathematics is appropriately presented.

2) A mathematics sequence for non-college aspiring students should be organized around mathematical content rather than around applications. Applications are important, and as many as possible should be included, clustered around the main content areas.

3) Non-college aspiring students should be actively involved in the learning process.

OBJECTIVES:

1) To develop booklets which deal with particular topics from the main content strands on which the sequence is based. These booklets are short (3-5 weeks in teaching time) and are based on performance objectives. Teacher's guides accompany each booklet.

2) To develop visual and manipulative aids and activities to accompany the written materials. The written materials and accompanying aids form a total learning package.

3) To field-test materials in pilot classes, and to revise the materials on the basis of the field-testing.

4) To provide in-service training in content, in teaching strategies, and in classroom management, for project teachers.

5) To evaluate the achievement and attitude of students using project materials, employing statistical and informal means.

SOURCE OF FUNDING:

U.S. Office of Education, under ESEA Title III; some Oakland Schools funds in third year of operational phase of the project.

PERIOD OF FUNDING:

Planning grant, September 1, 1966 - August 31, 1967
Operational grant, June 1, 1968 - June 30, 1971

CHARACTERISTICS OF THE STUDENT AUDIENCE:

The materials are designed for students in the 25th. to 55th. percentile range, as measured on a standardized mathematics test. This range includes students with fair to good mathematical ability, many of whom will have some learning problems. Many of these students will have experienced lack of success in mathematics. They are not remedial students, however. Most of this group will not be oriented toward college.

SPECIAL FEATURES OF THE MATERIALS:

1) The mathematical ideas are developed in a sequential and spiral manner, with several major content strands developed.

2) The materials are based on performance objectives, which are set forth in the teacher's guides.

3) The material for each grade level consists of a series of small booklets.

4) Student involvement is stressed (about 1/3 of the lessons involve the student in more than pencil and paper activity).

5) The visual, manipulative, and written materials have been developed as a total learning package.

MAJOR CONTENT STRANDS:

1) Algebra. Work with equations, inequalities, functions, graphing of relations, exponents, multiplication of binomials.

2) Geometry. Emphasis on geometric properties in two and three dimensions.

3) Trigonometry. Indirect measurement, scale drawing, use of the trigonometric functions.

4) Measurement. Linear measure, angle measure, perimeter, area, volume.

5) Computation. Computational worksheets, interspersed drill activities, development of operations with directed numbers.

6) Probability and Statistics. Probability, descriptive statistics, some inferential statistics (at an intuitive level).

7) Critical Thinking and Problem Solving. Activities incorporated in project booklets.

INNOVATIVE TEACHING METHODS:

1) Student involvement in laboratory experiences which are incorporated in the project booklets.

2) Much work is done in small groups.

MATERIALS DEVELOPED TO DATE:

Grade 9

Geometric Excursions. Non-metric three-dimensional geometry and space perception.

Activities With Ratio and Proportion. Ratio, proportion, per cent, featuring laboratory experiments.

Exploring Linear Measure. Estimation, "caveman" units, ruler use.

Equa·Formu·Alities. Equations, formulas, inequalities, using the balance beam for motivation.

Angle Measure. Measuring and drawing angles. Angles as the union of two rays and as the amount of rotation.

Where Is The Point? Location and coordinatization schemes.

Similarity and Congruence. Similar figures (figures with the same shape) and congruent figures (figures with the same shpae and size).

Grade 10

Reflections and Rotations. Line symmetry and rotational symmetry. Kaleidoscope designs.

The Algebra Game. Directed numbers, equations, inequalities, exponential notation.

Ratio and Proportion Revisited. Extension of ratio and proportion ideas. Decimal representation.

The Per Cent Calculator. Constructing and using a per cent calculator (nomograph). Per cent from a proportion point of view.

Rims and Regions. Perimeter and area.

Patterns, Rules and Lines. Linear relations and their graphs. Physical experiments generating linear functions.

Square Roots and Hot Wheels. Perfect squares. Square roots. Using square root tables.

Number Power. Exponential notation. Scientific notation.

Algebra For Squares. Linear and quadratic relations. Multiplication of two binomials.

Applying Proportions. Devices which apply ratio and proportion techniques.

Taking Chances. An experimental approach to probability.

SOME BASIC STATISTICS:

There are 28 local school districts in Oakland County. The table below shows the increase in district participation in the project from its initial field-testing to the present time.

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

GENERAL STUDENT REACTION:

Students have indicated that they have learned a considerable amount from the materials, that the materials are suitable in difficulty, format, reading level, and interest level, and that the students would be willing to study additional material of the same type. The typical student response on nearly every item surveyed has been neutral or somewhat positive.

RESULTS OF 1969-70 FIELD TESTING:

Booklet	Test	Number of Students	Number of Items	Mean	Standard Deviation	Mean Gain	G Statistic
Geometric Excursions	Pre	1203	16	5.33	2.23		
	Post	1203	16	8.80	3.29	3.47	.31
Activities with Ratio and Proportion	Pre	1210	20	9.64	3.73		
	Post	1210	20	12.56	4.33	2.92	.28
Exploring Linear Measure	Pre	1105	24	9.85	4.09		
	Post	1105	24	14.11	5.01	4.26	.30
Equa-Formu-Alities	Pre	1117	25	10.64	3.93		
	Post	1117	25	15.46	5.40	4.86	.34
Angle Measure	Pre	852	26	8.61	3.54		
	Post	852	26	15.38	5.05	6.77	.39
Where Is The Point?	Pre	858	20	5.30	2.29		
	Post	858	20	9.90	3.86	4.60	.31
Similarity and Congruence	Pre	354	16	4.95	2.10		
	Post	354	16	9.98	3.34	5.03	.46
Reflections and Rotations	Pre	161	14	2.75	2.45		
	Post	161	14	9.15	2.45	6.40	.57
The Algebra Game	Pre	157	25	11.03	4.33		
	Post	157	25	14.57	5.98	3.54	.25
Ratio and Proportion Revisited	Pre	102	12	2.60	2.03		
	Post	102	12	5.14	3.07	2.54	.27
The Per Cent Calculator	Pre	174	11	3.48	1.71		
	Post	174	11	5.76	2.57	2.28	.30
Square Roots and Hot Wheels	Pre	174	15	5.52	2.52		
	Post	174	15	8.90	3.33	3.38	.36

The G statistic is the ratio of actual gain to possible gain. For the Geometric Excursions booklet, the G statistic was computed as follows: $\frac{8.80 - 5.33}{16 - 5.33} = \frac{3.47}{10.67} = .31$

PERSON TO CONTACT FOR FURTHER INFORMATION:

Dr. Albert P. Shulte, Project Director
Oakland Schools
2100 Pontiac Lake Road
Pontiac, Michigan 48054