AN ITEM ANALYSIS
OF THE COOPERATIVE MATHEMATICS TEST IN GEOMETRY
GIVEN AT DANBURY HIGH SCHOOL

AN ABSTRACT OF

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by

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The problem of student achievement in geometry is a matter of concern to all those involved--students, parents, teachers, and other school officials. The purpose of this study is to locate student weaknesses in geometry and offer suggestions to the Mathematics Department which will help to overcome these weaknesses.

Often standardized tests are used as an aid in the evaluation of the effectiveness of a mathematics program. The writer is of the opinion that a good, reliable standardized test, one which is valid for a specific group of students in that it tests most of the educational objectives of the local mathematics program, and that includes norms which are based on an appropriate reference group, is a valuable tool in making such a program evaluation.

Such a standardized achievement test in geometry, published by Educational Testing Service (ETS), Princeton, New Jersey, was administered to 396 geometry students in Danbury High School, Danbury, Connecticut, on May 24, 1972. The writer's task was to perform an item analysis of this test, specifically to reveal real and significant weaknesses in Danbury's geometry course so that this course of study could more adequately meet the educational needs of the individual.

In an introduction to the item analysis, the writer explains that each of the Cooperative Mathematics Test items has been classified under one of fifteen major topical headings. The writer comments on the test in general, with respect to the local group. Items appropriate for the Danbury students were selected. Some of the factors which must be considered when viewing test results in relation to the objectives of the course are named.

The writer, a geometry teacher for six years, notes that the opinion expressed throughout the item analysis is her own. Information was obtained, however, from discussions with geometry students and other geometry teachers.

An examination of the test items, classified under the fifteen major topical headings, follows. Evaluation of student performance in each topic is given.

The writer summarizes the study by drawing conclusions concerning the test itself. In her opinion the test is a valid measure of the achievement of the local students and it is reliable. The writer cannot judge for herself that the norms given in the test Handbook came from a random sample of students nationally, but she will accept the statement of ETS on this matter.

Several conclusions regarding student achievement are discussed. The writer notes five areas in which the study indicates performance of local students should be improved, specifically (1) angle relationships and parallel

lines, (2) congruence, (3) logic and nature of proof, (4) application of the Pythagorean Theorem, including the converse of the theorem and special right triangles, and (5) properties of polygons of more than three sides.

The writer points out some general problems which are apparent by analysis of incorrect choices made by students throughout the test. A major difficulty is that students do not read carefully. Another problem relates to the use of diagrams and students' tendency to assume that things are the way they appear. Students do not take the time or else do not know how to analyze a problem. They do not seem to check their work. The process of generalization is not easy for students. Some pupils have difficulties which stem from earlier work in algebra and even basic arithmetic. Often memorization of essential information is treated too lightly by students.

The writer offers some suggestions to the Mathematics Department at Danbury High School. Geometry teachers should be informed of the findings of this study and interested persons should work, preferably as a group and at the next In-Service Day program, on solutions to the problems. The writer also suggests that a new outline of content be written for the Danbury High School geometry program. This course outline should give approximate lengths of time to be spent on each unit, this being done in accordance with the findings of the study.

The writer believes it is possible for these course modifications to take place this coming school year. At the end of the year the Cooperative Mathematics Test in geometry could be administered again for the purpose of program evaluation. Hopefully, if teachers put forth a concentrated effort, the results would show improvement in student achievement in the designated problem areas.