

A MATHEMATICS CONTEST—ITS RELATION TO THE GENERAL PROBLEM OF INDIVIDUAL DIFFERENCES.

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It is a remarkable fact that teachers of academic subjects have never made use of the interscholastic competitive element which is admitted to be a powerful stimulus to effort in athletic contests. An athletic contest develops enthusiasm and ability to the highest degree on the part of the contestants. The question arises whether such contests are equally effective in a purely academic subject, e. g., mathematics.

The writer attempted to answer this question by devising a contest between teams chosen from first-year mathematics classes of two Chicago schools. The teams represented Hyde Park High School and the University High School. Faculty representatives of the mathematics departments of the two schools formulated the following rules to govern the contest.

I. *General Agreements:* A team is to consist of the six best students chosen from first-year classes. The department of each school chooses the captain of its team. Minimum courses shall be submitted to Professor Herbert E. Cobb of Lewis Institute who shall formulate a series of questions for a preliminary written contest of one and a half hours. Questions shall be filed in a sealed envelope with the principal of University High School on the day of the contest. The principal shall submit the questions one hour before the contest to a joint meeting of faculty representatives of the two schools. The representative of either school may eliminate all questions which are not definitely included in the course of the school represented. The teams shall meet at 3:30 p. m., May 28, 1915, at the University High School for the preliminary contest. Papers shall be graded by three prominent mathematics teachers. Judges shall not mark the papers but use score cards showing individual scores, and team totals. The team having the greater average total shall be awarded one point of the general contest. The result shall not be announced until the close of the oral contest.

II. The oral contest shall be open to the general public. Two points will be awarded. The first point is to be awarded on theory. Questions for oral contest are to be submitted by Professor H. E. Slaughter, in accordance with the technique of Section I. At the time of the contest each question shall be writ-

ten on the blackboard and a definite period of time given for silent study. When a student is satisfied that he is able to present a solution of the problem he is to indicate this fact by standing. When the official timekeeper indicates the expiration of time each captain shall choose from the opponents standing, one student who is to be permitted to take his paper and place solution on the board. The teams shall alternate in presenting solutions. Judges shall grade the theory of solution presented on a basis of ten. The team whose representative makes a total failure shall be given a penalty of -2 . The chairman of judges shall have the privilege of calling for a second independent solution of the same problem. He shall designate a short period of silent study and the procedure shall be the same as in the first case. This solution shall be graded on a basis of twelve. The team whose total on mathematical theory in this oral contest is the greater shall be awarded one point of the general contest.

III. (a) The official timekeepers shall keep a record of the total number of each team volunteering a solution for the various questions. Fifty special points shall be awarded in the ratio of the total numbers of volunteers of the two teams, e. g., if thirty-seven volunteers for University High and thirty-five for Hyde Park, then University High shall be given 25.7 points and Hyde Park 24.3 points. (b) The judges shall grade the written and oral expression of each team on a basis of 50.

The team gaining the larger number of points in sections *a* and *b* shall be awarded a point in the general contest.

IV. The team winning two or more of the possible three general points shall be declared the winner.

THE CONTEST.

The try-outs for the teams absorbed for weeks the interest and efforts of every "A" student in the two schools. At Hyde Park the teachers held review contests between the various freshman sections. At University High School practice teachers divided the classes into teams and devoted a fractional part of each period for review contests. Team scores and individual scores were posted from day to day. Interest in mathematics ran high in both schools.

The oral contest was held at University High School on June 4th. The audience filled the school's largest room. Only one baseball game on the school's schedule rivaled the contest in numbers and enthusiasm. This large audience attended in spite of the fact that conditions were very unfavorable on the particular

day in question. Other school activities competed for the audience. In particular an elaborate garden party, supper, and dance followed the contest. This social affair seriously tempted a large number to remain away. In spite of this the audience "stuck" even after seemingly decisive results had been announced. It was certainly a rare and unusual educational scene of "rooting" sections with pencils and pads eagerly following the progress of the teams. The teams were not excited by the audience. There was very little evidence of nervousness after the first few minutes. The University High team averaged twelve years and three months, perhaps as young a first-year mathematics team as could be gathered anywhere. This team stood up well in the contest which was close at all times. Hyde Park showed remarkable staying powers, holding itself down to steady, consistent work even after disheartening announcements. The Hyde Park team finally won the contest, two to one. The judges graded independently throughout and submitted score cards showing details that agreed substantially throughout in spite of the fact that the contest was exceedingly close—in fact the scores were actually reversed near the close of the contest. The decision was as decisive as in a 100-yard dash.

The mathematics faculties agree that the experiment was of great educational significance. Agreements have been reached whereby the two schools will have an annual mathematics "meet" in the future, extending throughout the four years of high school mathematics. A valuable cup has been donated and will be the object for competition, for several years. Some of the technique has been revised slightly and interest will be accelerated.

The experiment is a definite suggestion for other departments. It seems to be entirely possible to have contests in Latin, history, mathematics or even general inter-class contests with as much enthusiasm and profit as an athletic contest. An enthusiastic teacher of arithmetic would certainly find it profitable if he were to take a team to some neighboring grade building and let them "scrimmage" against the team of one of his mathematics friends. The old-time "spelling bees" certainly were a powerful stimulus and there seems to be no reason why the same idea cannot carry over to other academic studies.

No doubt there are objections to the scheme, especially if it is not carefully directed. But in this it is like an athletic contest. Its value will depend, as every school activity does, on the

degree and quality of faculty direction. A hearty spirit of co-operation on the part of the two faculties will insure success to the larger issues involved.

REAL SIGNIFICANCE OF CONTEST.

The writer does not wish to exaggerate its significance. It is simply a unique device which may upon experimentation prove to be of assistance in the solution of the problem of individual differences inasmuch as it will be a powerful stimulus to the enthusiasm and effort of the "A" student in mathematics. There is considerable evidence that teachers of mathematics are putting forth serious effort to solve the problem of individual differences. Recent programs are characterized by discussions of supervised study, standard tests, and devices for teaching pupils how to study. But these topics are directed to help the slow worker. It is in accord with our American ideals that our first efforts should be directed towards helping the slow worker. But the fast worker is entitled to consideration. It is necessary that a definite technique be developed to direct in the most efficient way the enthusiasm and energy of the fast worker in mathematics. Mathematics exhibits built up by students (see the article by Reeve in *School and Society*, August 7, 1915), mathematics clubs, and proper library direction of supplementary reading are designed with the same purpose. The mathematics contest may constitute a part of this larger technique that needs to be developed. For a more complete discussion of the relation of the contest to the general problem of individual differences, the reader is referred to a series of articles by the author beginning in the October number of the *School Review*.

BULLETIN 1915, NO. 35.

The United States Bureau of Education has just issued Bulletin 1915, No. 35, on *Mathematics in the Lower and Middle Commercial and Industrial Schools of Various Countries Represented in the International Commission on the Teaching of Mathematics*.

This bulletin has been prepared by Dr. E. H. Taylor, with the editorial co-operation of the members of the Commission in the United States. It is a bulletin of ninety-six pages, and will be furnished to teachers of mathematics upon application to the United States Bureau of Education at Washington.