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Prediction of Success In BSCS Biology At The 9th Grade Level

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To truly accelerate students in science and mathematics at the secondary level, we must be able to



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predict success in science and mathematics before the student progresses too far in the accelerated course sequence.

Although the controversy of grade placement of secondary science subjects has not been settled to the satisfaction of all, there is evidence to support placement in some manner other than the traditional 10th biology, 11th chemistry and 12th physics. Yager (1962a) in three studies indicated no disadvantage in presenting the general biology course at the ninth grade level. Mathes (1960) indicated that selected ninth graders did very well when compared with the average tenth grade biology students. Wallace (1963) reports that a select group of superior ninth grade students scored better than the entire group of tenth grade students involved in the BSCS evaluation program. With regard to chemistry placement, Yager (1962b) indicates that chemistry can be successfully presented at the tenth grade level. Cressman (1960) demonstrated that general chemistry principles above the general science level could be mastered at the junior high level.

In 1962, the Keokuk Junior and Senior High School initiated an ac-

celerated program in science with the following sequence planned for the accelerated track: ninth biology, tenth chemistry, eleventh grade physics or mathematics electives and twelfth grade second level courses in biology, chemistry, physics or mathematics. Basic earth science and physical science courses are given at the seventh and eighth level to prepare the students for the sequence. Major questions arise when such a sequence is proposed. How can students be selected for 9th biology with reasonable assurance for successful completion of the course, as well as successful continuation of the accelerated sequence? What predictive mechanism can be used in the selection of these students?

PURPOSE OF THIS PAPER

(1) To suggest an objective method of predicting success in BSCS Biology for above average ninth grade students before they become involved in the course. (Prediction based upon test data to be collected prior to the ninth year.)

(2) To print some data about achievement of a group of ninth grade students in BSCS Blue Version (non-block) Biology. This might serve as a comparison for others using these materials or contemplating doing so.

(3) To show the correlation between I.Q., Read General Science Test Scores, Nelson Biology Pre-test Scores, Iowa Test of Educational Development total and the total scores on the five BSCS tests given to a selected group of ninth grade students.

THE PROJECT

For the 1962-63 school year, three classes of top level 9th graders (94 out of 285 ninth graders) were selected for BSCS Blue Version Biology. Due to the complex scheduling pro-

cedure, these students were placed in biology because of choice of foreign language and other reasons and in no way was the placement made dependent upon previous experience or records in science. All students were given the Otis I.Q. test at the 7th grade level and the Read General Science Test at the 8th grade level. Scores for the Iowa Tests of Educational Development became available and the Nelson Biology Test (form Am) was given as a pre-test during the first week of school in September 1962. See table I for test results.

Test	Mean	SD
Otis I.Q.	118.48	7.49
Read Gen. Sci.	109.52	8.96
ITED total	89.63	9.25
Nelson Biology pre-test ..	33.83	6.65

TABLE I. Results of testing, 94 selected 9th grade students.

During the school year the four quarterly BSCS tests and the final BSCS comprehensive test were given. See table II for results.

Test	Mean	SD
BSCS I	22.48	5.12
BSCS II	23.18	4.91
BSCS III	22.09	5.85
BSCS IV	20.72	4.67
Final	25.21	4.91
Total (all 5)	113.51	21.86

TABLE II. Results of BSCS tests, 94 selected 9th grade students.

For the purpose of this study, success in BSCS Biology was determined by using the composite score of the five BSCS tests given during the year. In actually grading the students, laboratory work, discussion participation, and oral reports also entered into the evaluation. A composite score of 104 or less was selected to be used as an indication of an unsuccessful experience in the biology class. Twenty-nine students from the original group of 94 were found to have scores of 104 or less and also were found to have received a letter grade of C or lower in the course. In the opinion of the authors, the 104 score is a very challenging score; probably several points above what

could be expected to be successful under normal conditions.

In order to determine the predictive value of the various tests, the following correlation coefficients were computed. See table III.

Correlation Gps.	Correlation Coefficient
Otis I.Q. vs. BSCS total	+0.27
Read Gen. Sci. vs. BSCS total	+0.66
ITED total vs. BSCS total	+0.62
Nelson Biol. Pre-test vs. BSCS	+0.78

All significant to the .01 level of confidence.

TABLE III. Correlation between BSCS composite score and the various tests used in this study.

From this data a hypothetical cut off level of admission to BSCS biology at the ninth grade was established as follows:

Read General Science Score—	106 raw score
Nelson Biology Pre-test (Am)—	28 raw score
ITED Composite score (5 tests)—	80 total score

A failure to meet any two of the above three cut off levels would make the student inelligible for BSCS biology at the ninth grade and would predict unsuccessful completion of the course. I.Q. was not used due to the low, although positive correlation and because the entire group had above average ability. In retrospect it can be said that by applying these criterion to the data that was available before the start of the course, 16 out of the lowest 29 students (below the 104 total) would have been selected against before the start of the course and would have been advised to continue another year of general science before taking biology at the tenth grade level.

During the 1963-64 school year it was again necessary to place students into the ninth biology classes because of a wide range of factors including foreign language choice and mathematics abilities. Any previous information about science ability was again not used in selecting students. The three cut off criteria were applied to this group. On this

basis it could be predicted that 23 out of the 85 students involved would be unsuccessful according to the 1962-63 standards. The verification of this prediction will not be available until the end of this school year. Additional data has been collected on the 1963-64 group in the form of science interest tests and science vocabulary tests (Science Service, Washington, D.C.) that were given in the seventh and again in the eighth grade. These will be correlated with the final BSCS scores in hope of obtaining further information upon which to base a prediction of a successful experience in BSCS Biology at the ninth grade. It is hoped that this prediction system can actually be used in preparing the schedule for the 1964-65 biology group. It is obvious that such factors as desire, interest, future job prospects, maturity and teacher-student support enter into a successful experience in the biology course. There has been no attempt to evaluate these conditions in this study.

CONCLUSIONS

(1) It appears that a predictive formula based on Read General Science, Nelson Biology and ITED test scores can be used to select ninth grade stu-

dents who will be successful in BSCS Biology.

(2) I.Q. is of little predictive value in groups where the range is from 100 on up and where the average is over 110.

(3) The high correlation between the two science tests (Read General Science and Nelson Biology) and final achievement in BSCS Biology indicates that previous background in general science is valuable for continued success in science—in this case BSCS Biology.

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These BSCS students from the Ottumwa High School are experimenting with enzymes. No matter what level biology is taught, laboratory work centered around an investigation makes it a fascinating subject for students to study.