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Prediction of Success in BSCS Biology at the 9th Grade Level

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Abstract: The scores of The Kuhlmann-Finch I.Q. test, Nelson Biology Test, Read General Science Test and Iowa Tests for Educational Development were correlated with success in BSCS Biology as indicated by the BSCS Test scores. A prediction of success standard based upon these test scores is presented. It is concluded that the BSCS success can be predicted by using the Read General Science and Nelson Biology test scores.

To truly accelerate students in science and mathematics at the secondary level, we must be able to predict success in science and mathematics before the student progresses to 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 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, we at the Keokuk Junior and Senior High School initiated an accelerated 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. The big question that arises is how can students be selected for 9th biology with reasonable assurance for successful completion of the course; as well as successful con-

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tinuation in 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, Nelson Biology Pre-test, Iowa Test of Educational Development scores 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 procedure, these students were placed in biology due to choice of foreign language and other reasons and in no way was the placement due to previous experience or records in science. All students were given the Kuhlmann-Finch I.Q. test at the 7th grade level, the Read General Science Test at the 8th grade level, scores of the Iowa Tests of Educational Development became available and the Nelson Biology Test (form Am) was given as a pre-test.

Table 1. Results of testing, 94 selected 9th grade students.

Test	Mean	SD
Kuhlmann-Finch I. Q.	118.48	7.49
Read General Science	109.52	8.96
ITED total	89.63	9.25
Nelson Biology pre-test	33.83	6.65

During the 1962-63 school year the four quarterly BSCS tests and the final BSCS Comprehensive test were given.

Table 2. BSCS test results, 94 selected 9th grade students

Test	Mean	SD
BSCS I	22.48	5.12
BSCS II	23.18	4.41
BSCS III	22.09	5.85
BSCS IV	20.72	4.67
BSCS Final	25.21	4.91
Total (all 5)	113.51	21.86

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 as an indication of an unsuccessful experience in the biology course. Twenty nine students from the original group of ninety four were found to have scores of 104 or less and also received a letter grade of C or lower in the course. In my opinion the 104 score is a challenging score for 9th graders. In order to determine the predictive value of the various tests, the following correlation coefficients were computed.

Table 3. Correlation between BSCS composite score and the various tests used in this study.

Correlation Groups	Correlation Coefficient
Kuhlmann-Finch I. Q. vs BSCS total	+0.27
Reand 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	

From the above 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) — 80th percentile

A failure to meet any two of the above three cut off scores would make the student ineligible for BSCS Biology at the ninth grade and would predict unsuccessful completion of the course. I.Q. was not used due to the low correlation and due to the fact that the entire group had above average ability. In retrospect it can be said that by applying these criterion to the data I had available before the start of the course, 16 out of the lowest 29 students (those below 104 BSCS 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 due to a wide range of factors including foreign language choice and mathematics abilities and not specifically due to any previous information about science ability. I have applied the three cut off criteria to this group and on this basis I would predict that 23 out of the 85 students involved will be unsuccessful according to the 1962-63 standards. The verification of this prediction will not be

available until the end of the 1963-64 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 rapport enter into a successful experience in the biology course. I have not attempted 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 students 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 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 sciences is valuable for continued success in science; in this case BSCS Biology.

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