

A STUDY OF STUDENT ACHIEVEMENT
AS EVIDENCED BY GRADES IN TWO INTRODUCTORY
BIOLOGY COURSES IN A LARGE AMERICAN UNIVERSITY

A Thesis

Presented to

the Faculty of the Department of Psychology
University of Houston

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Psychology

by

Frank G. Flanagan

August, 1966

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ABSTRACT

This study was undertaken to analyze student achievement as evidenced by grades made in two introductory courses in biology at a large university during the fall and spring semesters, 1964-65. These courses are recommended at the freshman level. They are designed to offer a foundation in the principles of general biology as background for later specialization in the area of botany, zoology, biochemistry, and other life sciences.

Both courses consisted of two television lectures and one class meeting per week. The class meetings consisted of summarizing the television lectures of the previous week and administering ten unannounced quizzes during each course. Final course grades were determined by scores on two one-hour departmental tests, one departmental final examination, and the quizzes given in class.

The majority of data for this study was derived from the final grade sheets of the individual instructors of each course. The university counseling and testing service provided Scholastic Aptitude Test scores for a random sample of freshman students.

The analysis of data revealed these findings:

- (1) A high rate of failure was noted in Biology A.
- (2) The frequency of grades in Biology B was well distributed.
- (3) The enrollment in Biology B reflected a 26% decrease when compared with Biology A.
- (4) Two instructors, one in each course, departed markedly from their fellow instructors in the high percentage of D & F grades assigned.
- (5) The best chances for success in both courses appear to be in the sophomore year.
- (6) For a random sample of freshman students enrolled in Biology A, a significant relationship existed between course grades and SAT-Verbal and Total scores.

It was recommended that the department under consideration reconsider the difficulty level of both courses. Similar studies of these courses for subsequent years were recommended to discover trends. It was further recommended that other departments of instruction conduct similar studies of student achievement.

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CHAPTER I

THE PROBLEM

A university that is experiencing a period of rapid expansion must be cognizant of various factors affecting its growth and development. Serious attention must be given to selection procedures, course offerings, course content, grading practices, and many other factors of concern in fulfilling the goals of the university.

Selected for study here was student achievement in a two-semester introductory Biology course as evidenced by:

1. The combined distribution of grades in all sections of the two courses.
2. The distribution of grades by each instructor.
3. The relationship of grades with Verbal and Total scores of the College Entrance Examination Board Scholastic Aptitude Test.

When undertaking to analyze student achievement, recognition must be given to the fact that many variables exist which do not lend themselves to objective assessment. Within the faculty individual differences exist with regard to teaching style or performance, weight assigned to class attendance and participation, and the availability of the instructor for private consultation with students. Student performance may vary with regard to prior subject knowledge, personal problems of the moment, and motivations for taking the course. A recent study of student performance in law courses revealed that the average performance of students in evening courses was significantly below students in day courses. (12)

Special mention is deserved by two similar studies concerned with introductory History and Political Science courses. (4) (9) Both studies confirm the importance of a careful consideration of grading practices with regard to student and institutional objectives. Course grades may affect the student's evaluation of his personal capabilities and potential, may serve as a basis for readjusting his educational and vocational goals, and may alter the image he has of the faculty and university.

This chapter has presented the purpose of this study and the problem chosen for investigation. Chapter II will present a survey of related literature. Chapter III will outline the materials and procedures used in this study. Chapter IV will provide an analysis of the compiled data. Chapter V will summarize the study and cite conclusions and recommendations.

CHAPTER II

SURVEY OF LITERATURE

Research studies reveal widespread differences in grading practices throughout our educational system. Underlying this circumstance is the existence of differing philosophies concerning the function of marking standards. For example, Travers and Gronlund (1950) found wide differences of opinion among the members of a graduate faculty concerning the meaning of various marks and the methods of assigning them. (8) Odell (1950) reported that, where a typical five-letter system is used, the highest letter is likely to vary from 0% to 40% or more. The next highest letter will likely vary from 10% to 50% or more, and the failure mark from 0% to 25% or more. (6)

Starch and Elliot (1913) conducted a classic study on the unreliability of instructors' marks on examination papers. Identical copies of an English examination paper were given to 142 English instructors. They were instructed to score it on the basis of 100% for perfection. Discussion among instructors was not permitted, making impossible a relative basis for judgment. Scores on the identical papers ranged from 50% to 98%. (7)

Kartye (1965) analyzed grades of 5,830 students enrolled in two freshman level American history courses at this university during the spring and fall semesters of 1964. A high rate of failures for both courses each semester was found. Little relationship was found to exist between freshman grades and SAT scores. (4) In a similar study of two sophomore political science courses at this university, Vrooman (1966) also found a high percentage of failing and near failing grades. A significant relationship was found to exist between sophomore grades and SAT scores. This finding held true for the sections of each course utilizing televised instruction and those which did not. No significant differences were ob-

served between grades given in televised sections and grades given in non-televised sections. (9)

The grading practices of a college faculty were investigated by Aiken (1963). During the period under study, admission requirements at the institution were progressively modified for greater selectivity of beginning students. Subsequent grades awarded these students did not reflect a greater proportion of high grades, though the quality of the student body had been improved. Aiken concluded that the faculty based grades on relative achievement rather than the quality of individual performance. (1)

Ebel (1965) provides an extensive discussion of absolute versus relative marking systems. He suggests several corrective measures to insure that grades will effectively serve their purpose.

1. The major shortcomings of marks can be overcome by clearly defined and scrupulously observed meanings for marks on an institution-wide basis.
2. Marks should ordinarily be based exclusively on achievement and should not attempt to indicate attitude, effort, or deportment.
3. Marks measuring status tend to be more reliable, more meaningful, and educationally more constructive than marks measuring growth.
4. Publication of distribution of marks, course by course, is essential to quality control of the marking system. (2)

The predictive validity of the College Entrance Examination Board Scholastic Aptitude Test is cited by various investigations. French (1958) investigated the relationship between SAT-Verbal scores and grades in social science courses. Ten institutions were included in the study. He found an average correlation of $r=.43$. (3) Myers (1952) used a multidimensional predictor of freshman grade point averages which included the SAT. SAT-Verbal scores were found to correlate .44 with freshman grade point averages at an eastern women's liberal arts college. (5)

SAT scores were considered in relation to the academic progress of entering

freshmen in a study (1965) conducted by the counseling and testing service of the university under consideration in the present investigation. For a total 1,022 entering freshmen in September, 1962, the average SAT-Total score was 850. 45% made a cumulative grade point average of C or better for the two long semesters of the 1962 - 63 school year. The average SAT-Total score was 975 for 1,466 freshmen entering September, 1963. 57% of this group made a cumulative grade point average of C or better for the two long semesters of the 1963 - 64 year. (10) The approximately 14% increase in the average SAT-Total score from the 1962 group to the 1963 group was accompanied by a 12% increase in average or better academic performance by the 1963 group when compared with the 1962 group.

CHAPTER III

MATERIALS AND PROCEDURES

Description of the Courses

Biology A and B are the initial courses offered by the Department of Biology. They are offered as electives within a list of courses approved for satisfaction of the science core curriculum requirements of certain degree plans at the university. These courses are recommended at the freshman level. The two courses are designed to offer a foundation in the principles of general biology as background for later specialization in the areas of botany, zoology, biochemistry, and any other of the life sciences. The first semester of the course may be taken for credit without completion of the second semester, but the second semester cannot be taken without the first as prerequisite.

Both courses consisted of two television lectures and one class meeting per week. The class meeting consisted of summarizing the television lecture of the previous week and administering ten unannounced quizzes during each semester. Two one-hour departmental tests and one departmental final examination were administered to all sections simultaneously and collectively. Final grades were computed on the basis of a maximum number of possible points. Students accumulating a sum of less than 300 points were assigned the grade letter F. Letter grades of A, B, C, and D were determined by "natural breaks" in the overall distribution of total points which fell above half the maximum possible points.

Description of the Group

The group investigated in this study consisted of 2,233 students enrolled in Biology A and Biology B during the fall and spring semesters, 1964-1965. This group was divided in two parts consisting of 1,280 students enrolled in Biology A during the fall semester, 1964, and 953 students enrolled in Biology B during the spring semester, 1965. Two sections consisting of a total of 78 students were excluded from consideration in this study. Thirty-six (3.17%) of these students were enrolled in the only section of Biology B offered during the fall semester, and the remaining 42 (3.64%) comprised the only section of Biology A offered during the spring semester. It was felt that exclusion of these sections would improve the representativeness of the sample.

The total group under investigation consisted of six sections of Biology A and five sections of Biology B. Though these courses are recommended at the freshman level, 29.2% (374) of the Biology A group and 38.9% (371) of the Biology B group represented students classified as other than freshmen. It was not learned how many of these students were taking the course for the second time.

Description of the SAT

The College Entrance Examination Board Scholastic Aptitude Test (SAT) is designed to estimate the student's ability and readiness for college level work and provide a basis for prediction of probable success at the college level. The test is designed to estimate basic academic skills emphasizing reasoning ability rather than recall of facts. The Verbal section stresses the ability to read with comprehension, to reason with verbal material, and to perceive word relationships. SAT scores were a

condition of admission when freshman students in Biology A and B were admitted to the university.

Procedures Followed

Data for this study were obtained from the final grade sheets of instructors of Biology A, fall semester 1964, and Biology B, spring semester, 1965. All sections of Biology A taught during the fall semester and all sections of Biology B taught during the spring semester were included in the study.

Bivariate frequency distributions were tabulated from the grade sheet data. The tabulations were made by combining all sections taught by each instructor of each course and considering the data in terms of grades (A,B,C,D,F,W*,I**), and classifications, freshman (F), sophomore (S), junior (J), senior (SR), graduate (G), postbaccalaureate (PB). These tabulations are presented in Appendix A and Appendix B. From these data, all sections for each course were combined and the percentage of the total number of students attaining each grade was calculated. Also, for each course, the percentage of each classification attaining each grade was calculated and compared.

Individual instructor grading practices for each course were examined by calculating from the same data the percentage of the total number of students per instructor attaining each grade. Six instructors taught Biology A and five instructors taught Biology B. Instructors were identified by a code number 1 through 6 and 1 through 5, respectively, and instructor identity was known only to the investigator.

* Withdrawal - awarded any student who drops a course prior to the end of the fifteenth week of an eighteen week semester

** Incomplete - given a student who has not completed all assignments

Instructors 1 through 4 taught both semesters and maintain the same numerical designation in the presentation of data for each course.

SAT - Verbal and Total scores were obtained for a random sample of 340 students from a population of 906 freshman students enrolled in Biology A. The distribution of grades in the sample approximated that of the total group of freshmen being investigated.

Chi-square values were computed from which contingency coefficients were derived to estimate the degree of relationship between the test scores and the course grade. Chi-square was the statistic of choice because no particular assumptions have to be made about the shape of the distribution of the frequencies being tested and it lends itself to the treatment of this type of catagorized data.

This chapter has presented a description of the materials used in this study and outlined the procedures followed. Chapter IV will provide an analysis of the compiled data.

CHAPTER IV

ANALYSIS OF DATA

This chapter presents an analysis of the compiled data. The anonymity of the instructors of these courses is preserved by assigning each a code number. Instructors 1 through 4 taught both courses and each maintains his assigned code number throughout the study. A code number above 4 identifies an instructor who taught only one course.

Table I presents the frequencies of grades made by all students enrolled in Biology A during the fall semester, 1964. By inspection, it is evident that the grades are skewed in a positive direction. Of a total 1,280 students, 654 (51.1%) made grades in the below average range, either D or F, while only 210 (16.4%) made grades in the above average range, either A or B. Worthy of note is the high percentage (28.4%) of students making a grade of F. This percentage represents 363 students, the largest number in any of the grade classifications. By contrast, only 44 (3.4%) students of the large sample under study made a grade of A.

Table II presents the frequencies of grades distributed by each of the six individual instructors of Biology A. All sections taught by an individual instructor are combined. Without exception, all distributions are skewed in a positive direction. All instructors apportioned grades of D or F to over 40% of their students. Variation among the several instructors exists only in terms of the degree of positive skewness. The percentages of D & F grades given by five of the instructors reflect a relatively steady progression. Instructors 3, 6, 2, 1, & 4 gave D & F grades to 40.8%, 45.3%, 47.5%, 49.7%, and 53.2% of their students, respectively. Instructor 5 departed

TABLE I
Grade Distribution for Biology A
Fall Semester, 1964

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	44	3.4
B	166	13.0
C	301	23.5
D	291	22.7
F	363	28.4
W	100	7.8
I	<u>15</u>	<u>1.2</u>
	1,280	100.0

TABLE II
Grade Distribution by Instructors
Biology A, Fall Semester, 1964

Instructor No. 1 Four Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	9	5.3
B	25	14.6
C	47	27.5
D	35	20.5
F	50	29.2
W	5	2.9
I	<u>0</u>	<u>0.0</u>
	171	100.0

Instructor No. 2 One Section

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	2	5.0
B	8	20.0
C	9	22.5
D	8	20.0
F	11	27.5
W	2	5.0
I	<u>0</u>	<u>0.0</u>
	40	100.0

TABLE II (Continued)

Instructor No. 3

Eight Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	13	4.0
B	44	13.4
C	90	27.4
D	70	21.3
F	64	19.5
W	39	12.0
I	<u>8</u>	<u>2.4</u>
	328	100.0

Instructor No. 4

Twelve Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	11	2.3
B	68	14.0
C	109	22.3
D	110	22.5
F	150	30.7
W	34	7.0
I	<u>6</u>	<u>1.2</u>
	488	100.0

TABLE II (Continued)

Instructor No. 5

Four Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	4	2.4
B	9	5.4
C	25	15.0
D	47	28.1
F	70	41.9
W	11	6.6
I	<u>1</u>	<u>.6</u>
	167	100.0

Instructor No. 6

Two Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	5	5.8
B	12	14.0
C	21	24.4
D	21	24.4
F	18	20.9
W	9	10.5
I	<u>0</u>	<u>0.0</u>
	86	100.0

markedly from this range by giving D and F grades to 69.9% of his students. A similar trend is reflected by the same five instructors in observing the percentages of A and B grades assigned by them. Instructors 2, 1, 6, 3, and 4 gave A and B grades to 25.0%, 19.9%, 19.8%, 17.4%, and 16.3%, respectively. Instructor 5 again departed markedly from this range by giving A and B grades to 7.8% of his students.

Table III presents the frequencies of grades made by all students enrolled in Biology B during the spring semester, 1965. This group consisted of a total of 953 students. Unlike the grade distribution of Biology A, the frequency of grades for Biology B suggests the symmetry of a normal distribution. Grades in the A and B range and D and F range were closely balanced and represented 29.6% and 31.5% of the group, respectively. It is interesting to note, however, that 143 (15.0%) students made a grade of F. Only 79 (8.3%) of the students were assigned a grade of A.

A comparison of Table III with Table I reveals that grades in Biology B were substantially higher than grades in Biology A. Several factors may account for this difference. There were approximately 26% fewer students in Biology B than in Biology A. This appears to be largely the result of the high percentage of failures in Biology A. The students who perform poorly are weeded out, and the group moving on to Biology B include only the more capable students. Of the total 1,280 students in Biology A, 906 were freshmen. Since Biology A is prerequisite to Biology B, three fourths of the Biology A students were taking the course during their first semester in college. We may then speculate with considerable confidence that the high percentage of failing and near failing grades is partly attributable to the problems of adjustment to the college environment.

TABLE III
Grade Distribution for Biology B
Spring Semester, 1965

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	79	8.3
B	203	21.3
C	306	32.1
D	157	16.5
F	143	15.0
W	56	5.9
I	<u>9</u>	<u>.9</u>
	953	100.0

Table IV presents the frequencies of grades distributed by each of the five individual instructors of Biology B. All sections taught by an individual instructor are combined. The frequency of grades assigned by instructors 1 through 4 are well distributed. Of these four instructors, the grade frequencies of instructor 1 reflected the largest percentage point difference between the A and B grade range and the D and F grade range, and was negatively skewed. 37.8% of his students fell in the upper grade range and 24.2% comprised the lower grade range. Instructor 5, the only instructor who did not instruct Biology A the preceeding semester, distributed grades reflecting a positive skew. 38.7% of his students fell in the lower grade range and 19.8% fell in the upper grade range. In view of the fact that the highest percentage of low grades in Biology A was assigned by an instructor who also taught only once during the school year, one wonders if this fact may be worthy of departmental consideration.

The percentage of students by classification making each grade is presented in Table V. Biology A and B are considered separately. A comparison of Biology A and B reveals an interesting fact. Of the four undergraduate classifications, sophomores in both groups made the smallest percentage of low grades. The best chances of success in both courses appear to be in the sophomore year. This fact suggests the possibility that reconsideration should be given to the departmental policy of recommending these courses at the freshman level. While freshmen comprised the highest percentage of low grades in Biology A, they were exceeded in this range in Biology B by both juniors and seniors. The data for both groups fail to fulfill the normal expectation that, at each succeeding grade level, a greater percent of high grades would appear with a smaller percent of low grades. Conceivably, however, one may justifiably assume that junior and senior students are taking these initial biology courses only to satisfy degree

TABLE IV

Grade Distribution by Instructors

Biology B, Spring Semester, 1965

Instructor No. 1

Four Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	20	11.8
B	44	26.0
C	54	31.8
D	22	13.0
F	19	11.2
W	11	6.2
I	<u>0</u>	<u>0.0</u>
	170	100.0

Instructor No. 2

One Section

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	3	7.5
B	9	22.5
C	13	32.5
D	6	15.0
F	5	12.5
W	3	7.5
I	<u>1</u>	<u>2.5</u>
	40	100.0

TABLE IV (Continued)

Instructor No. 3

Eight Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	13	5.9
B	48	21.8
C	72	32.7
D	39	17.7
F	27	12.3
W	16	7.3
I	<u>5</u>	<u>2.3</u>
	220	100.0

Instructor No. 4

Eleven Sections

<u>Grade</u>	<u>No.</u>	<u>%</u>
A	30	7.9
B	87	22.8
C	117	30.7
D	67	17.6
F	60	15.7
W	17	4.5
I	<u>3</u>	<u>.8</u>
	381	100.0

TABLE IV (Continued)

Instructor No. 5		Four Sections
<u>Grade</u>	<u>No.</u>	<u>$\bar{x}$</u>
A	13	9.2
B	15	10.6
C	50	35.2
D	23	16.1
F	32	22.6
W	9	6.3
I	<u>0</u>	<u>0.0</u>
	142	100.0

TABLE V

Grades Distributed by Percentages in Each Classification

Biology A, Fall Semester, 1964

<u>Grade</u>	<u>F</u>	<u>S</u>	<u>J</u>	<u>Sr</u>	<u>G</u>	<u>PB</u>
A	2.7	4.0	4.9	3.8	0	66.6
B	13.0	11.2	12.8	17.0	0	16.7
C	22.9	27.6	22.9	20.8	0	0
D	23.5	21.6	18.8	24.5	0	0
F	29.9	24.3	27.7	24.5	0	0
W	7.0	10.3	9.9	9.4	0	0
I	<u>1.0</u>	<u>1.0</u>	<u>3.0</u>	<u>0</u>	<u>0</u>	<u>16.7</u>
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Students	906	214	101	53	0	6

Biology B, Spring Semester, 1965

<u>Grade</u>	<u>F</u>	<u>S</u>	<u>J</u>	<u>Sr</u>	<u>G</u>	<u>PB</u>
A	8.8	6.9	9.4	3.1	0	50.0
B	21.8	19.6	27.1	14.1	0	16.7
C	31.8	34.3	25.0	40.6	0	16.7
D	15.3	15.2	22.9	21.9	0	16.6
F	17.0	13.2	10.4	10.9	0	0
W	4.8	8.8	4.2	7.8	100.0	0
I	<u>.5</u>	<u>2.0</u>	<u>1.0</u>	<u>1.6</u>	<u>0</u>	<u>0</u>
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Students	582	204	96	64	1	6

requirements and their poor performance may be a function of their lack of interest. It is not known how many juniors and seniors were repeating either course to make up a failing grade.

Tables VI and VII present data utilized in determining the existence and degree of relationship between SAT scores and grades made by freshmen in Biology A. Because the course is recommended for freshman students, SAT scores were obtained for a random sample of 340 students selected from the total group of 906 freshmen enrolled in the course. Contingency co-efficients were calculated to determine any relationship between SAT scores and grades. The Chi-square test was used to determine the significance of any relationship.

Table VI presents the data used in the calculation of the contingency co-efficient between SAT-Verbal scores and course grades. A co-efficient of $C=.51$ was found to be significant at the .001 level of confidence. In Table VII, the contingency co-efficient between SAT-Total scores and course grades was $C=.16$ and was also significant at the .001 level. It was determined by inspecting the cells in each case that both relationships were in a positive direction.

The existence of a relationship between SAT-Math scores and course grades was not calculated because the two courses under study are primarily verbal in nature. The fact that both SAT-Verbal and Total scores were related to course grades in a positive direction suggests that SAT-Math scores and course grades could be negatively related. These relationships provide a fertile area for interesting speculation. Studies of SAT scores of entering freshmen at the university under consideration reveal that the mean SAT-Math scores have steadily increased in the years 1962 through 1964. (11) These studies also reveal that mean SAT-Math scores have been consistently higher than SAT-Verbal scores during the same period. The question arises as to why this is so. Though the initial courses in Biology are primarily verbal, mathematics becomes increasingly important in the

TABLE VI

Data Utilized in Determining Contingency Co-efficient

between SAT-Verbal Scores and

Grades of Freshman Students in Biology A, Fall Semester, 1964

Verbal Scores:	Below 400	400-499	500-599	Above 599
<u>Grades</u>				
A	0	4	5	6
B	3	10	21	11
C	13	37	31	5
D	17	37	32	4
F	<u>32</u>	<u>47</u>	<u>22</u>	<u>3</u>
Total	65	135	111	29

Total Students Being Considered: 340

$$C = .51^*$$

*Significant at the .001 Level of Confidence

TABLE VII

Data Utilized in Determining Contingency Co-efficient

between SAT-Total Scores and

Grades of Freshman Students in Biology A, Fall Semester, 1964

Total Scores:	Below 900	900-999	1000-1099	1100-1199	Above 1199
<u>Grades</u>					
A	0	4	3	3	5
B	2	8	20	11	4
C	25	22	24	9	6
D	26	34	21	7	2
F	<u>61</u>	<u>20</u>	<u>16</u>	<u>4</u>	<u>3</u>
Total	114	88	84	34	20

Total Students Being Considered: 340

$$C = .16^*$$

*Significant at the .001 Level of Confidence

advanced courses. Perhaps the initial courses are different from the more advanced courses in that they essentially constitute the learning of a new vocabulary.

It appears that the higher mean performance of freshmen in SAT-Math scores may be a function of the fact that mathematics is taught in the public schools for a much longer period than reading skills such as reading comprehension and English expression. Conventionally, reading skills are not taught past the fifth grade. Mathematics, which requires the learning of a specialized reading technique, is taught well into the high school years much as a separate discipline. This fact may largely explain why mean SAT-Math scores are consistently higher than SAT-Verbal scores; the technique of reading mathematical symbols is taught for a longer period of time than other reading techniques.

Three separate techniques of reading comprehension are required for algebra, history, and biology. Algebra deals with a compact system of symbols. It must be read carefully with particular attention given to minute details such as dots and subscripts. The verbal translation of a mathematical formula would require many words. Visual acuity is extremely important in this technique. History, by contrast, is read broadly and extensively. This technique focuses upon learning to read for ideas, trends, and the relationship among major events. Comprehension involves the sensing of the broad continuity of ideas.

Biology requires still a different technique. It initially consists of the development of a new vocabulary. This new vocabulary is replete with technical terms. These terms must be anchored to a visual model. It then involves the task of learning to comprehend these terms in relationship to each other. The initial courses in biology are essentially the learning of a new language. Viewed in this context, a purer predictor of success in freshman biology courses may be obtained by sectioning out only the vocabulary portion of the SAT-Verbal score. It appears

that this information would be more representative of the student's vocabulary background from which inferences could be made concerning his ability to develop new vocabulary skills. Still another consideration appears to bear merit. Because biological terms are primarily of Greek and Latin derivation, perhaps high school foreign language grades rather than English grades would provide a better predictor of success in freshman biology courses.

This chapter has presented an analysis of the data. Chapter V will set forth a summary of the study and cite conclusions and recommendations.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to analyze student achievement as evidenced by grades made in two introductory courses in biology at a large university. Information contained herein may be of assistance to those concerned with objectives of the department under consideration.

The majority of the data for this study was derived from the final grade sheets of the instructors who taught Biology A & B during the fall and spring semesters, 1964 - 65. Bivariate frequency distributions were tabulated from the grade sheets in terms of course grade and student classification for each course. The percentage of total enrollment assigned each grade was calculated for each course and for the combined sections by course for each instructor. Variations in the grade distributions of the various instructors was noted. The percentage of each student classification attaining each grade was also calculated and compared.

The university counseling and testing service provided SAT scores for a random sample of freshman students. Contingency co-efficients were derived from chi-square values to determine the relationship between SAT-Verbal and Total scores and course grades.

Conclusions

The findings of this study appear to support the following conclusions:

(1) Without exception, grade distributions of the combined sections of each instructor of Biology A were skewed in a positive direction. All instructors of this course apportioned D & F grades to over 40% of their students. One instructor assigned D & F grades to 69.9% of his students. Of a total enrollment of 1,280 in Biology A, 363 (28.4%) students made a grade of F.

(2) The frequency of grades for all sections of Biology B combined were well distributed. Only one instructor's grade distribution reflected a positive skew. 38.7% of his students were assigned D & F grades.

(3) The enrollment in Biology B reflected a 26% decrease when compared with Biology A. Nevertheless, of a total enrollment of 953 in Biology B consisting of only the more capable students, 143 (15%) students made a grade of F.

(4) One instructor in each course departed markedly from the other instructors with regard to the high percentage of D & F grades assigned. Both instructors taught only once during the two semesters under consideration.

(5) Of the four undergraduate classifications, sophomores in both Biology A and B made the smallest percentage of low grades. The best chances for success in both courses appear to be in the sophomore year.

(6) A moderate and significant relationship was found to exist between SAT-Verbal scores and course grades of a sample of freshman students in Biology A. A relationship between SAT-Total scores and course grades for this sample was found to be small but significant.

Recommendations

It is recommended that the Biology Department consider designing freshman biology courses at a reduced level of difficulty. Alternatively, it is recommended that the department consider limiting enrollment to students at the sophomore level and above.

It is recommended that similar studies of the courses be conducted for subsequent years to discover trends. It is suggested that future studies consider the value of high school foreign language grades as a predictor of college freshmen biology grades.

Finally, it is recommended that other departments of instruction conduct similar studies of student achievement.

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APPENDIX A

BIOLOGY A, FALL SEMESTER, 1964

Instructor 1

4 Sections

	A	B	C	D	F	W	I	Total
Fr.	7	20	36	26	39	5	0	133
So.	1	5	7	3	7	0	0	23
Jr.	0	0	2	3	2	0	0	7
Sr.	1	0	2	3	2	0	0	8
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	9	25	47	35	50	5	0	171

Instructor 2

1 Section

	A	B	C	D	F	W	I	Total
Fr.	1	6	6	6	10	1	0	30
So.	1	1	2	1	1	1	0	7
Jr.	0	1	1	1	0	0	0	3
Sr.	0	0	0	0	0	0	0	0
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	2	8	9	8	11	2	0	40

Instructor 3

8 Sections

	A	B	C	D	F	W	I	Total
Fr.	8	32	59	56	53	29	6	243
So.	2	3	21	6	4	5	1	42
Jr.	3	4	7	3	4	4	1	26
Sr.	0	5	3	5	3	1	0	17
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	13	44	90	70	64	39	8	328

Instructor 4

12 Sections

	A	B	C	D	F	W	I	Total
Fr.	5	47	76	83	103	17	3	334
So.	3	11	18	18	25	8	1	84
Jr.	0	8	10	5	16	5	1	45
Sr.	1	1	5	4	6	4	0	21
Gr.	0	0	0	0	0	0	0	0
PB	<u>2</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>4</u>
	11	68	109	110	150	34	6	488

Instructor 5

4 Sections

	A	B	C	D	F	W	I	Total
Fr.	1	5	18	30	52	5	0	111
So.	0	3	5	16	12	6	0	42
Jr.	1	0	2	0	5	0	1	9
Sr.	0	1	0	1	1	0	0	3
Gr.	0	0	0	0	0	0	0	0
PB	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>
	4	9	25	47	70	11	1	167

Instructor 6

2 Sections

	A	B	C	D	F	W	I	Total
Fr.	3	8	13	12	13	6	0	55
So.	1	2	6	2	3	2	0	16
Jr.	1	0	1	7	1	1	0	11
Sr.	0	2	1	0	1	0	0	4
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	5	12	21	21	18	9	0	86

CUMULATIVE
TOTAL

44	166	301	291	363	100	15	1,280
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APPENDIX B

BIOLOGY B, SPRING SEMESTER, 1965

Instructor 1

4 Sections

	A	B	C	D	F	W	I	Total
Fr.	14	26	26	14	14	8	0	102
So.	4	11	19	6	4	2	0	46
Jr.	2	6	4	1	0	0	0	13
Sr.	0	1	5	0	1	1	0	8
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
	20	44	54	22	19	11	0	170

Instructor 2

1 Section

	A	B	C	D	F	W	I	Total
Fr.	3	3	8	5	2	1	0	22
So.	0	4	1	0	1	1	0	7
Jr.	0	1	1	0	1	1	1	5
Sr.	0	1	3	1	1	0	0	6
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	3	9	13	6	5	3	1	40

Instructor 3

8 Sections

	A	B	C	D	F	W	I	Total
Fr.	7	38	40	23	21	6	2	137
So.	5	6	23	5	4	6	2	51
Jr.	1	4	7	7	1	0	0	20
Sr.	0	0	2	4	1	4	1	12
Gr.	0	0	0	0	0	0	0	0
PB	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	13	48	72	39	27	16	5	220

Instructor 4

11 Sections

	A	B	C	D	F	W	I	Total
Fr.	22	53	82	40	43	9	1	250
So.	3	16	19	11	10	6	2	67
Jr.	3	12	8	9	4	2	0	38
Sr.	1	6	8	7	3	0	0	25
Gr.	0	0	0	0	0	0	0	0
PB	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
	30	87	117	67	60	17	3	381

Instructor 5

4 Sections

	A	B	C	D	F	W	I	Total
Fr.	5	7	29	7	19	4	0	71
So.	2	3	8	9	8	3	0	33
Jr.	3	3	4	5	4	1	0	20
Sr.	1	1	8	2	1	0	0	13
Gr.	0	0	0	0	0	1	0	1
PB	<u>2</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>4</u>
	13	15	50	23	32	9	0	142

CUMULATIVE
TOTAL

79	203	306	157	143	56	9	953
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