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July 25, 1970

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN QUALITY OF HIGH SCHOOL SCIENCE PREPARATION AND ACADEMIC SUCCESS IN COLLEGE SCIENCES

by

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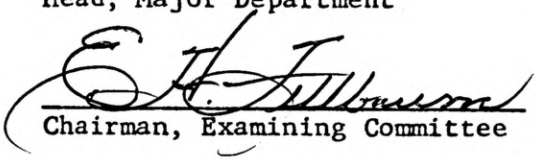
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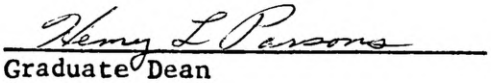
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ABSTRACT

This study examines the relationship of quality of high school science instruction to academic success in college sciences. The degree of relationship is expressed in terms of correlation units. Included is a rationale for utilizing quality as a variable, an arbitrary definition of quality, and a method for measuring quality.

Twenty students from Montana State University were interviewed. Determined from the interviews were quality of high school science instruction, grades in college sciences, grades in high school sciences, and number of science courses attended in high school. Data from the interviews were subjected to an analysis of correlation. A low correlation (+0.40) existed between quality of instruction and academic success in college sciences. This compared almost exactly with the correlation (+0.41) of number of science courses attended in high school to academic success in college. The largest correlation (+0.60) was between high school science grade-point-average and academic success in college. It was found that the multiple correlation of high school science units plus quality ratings correlated to academic success in college sciences was +0.55.

The results of the study indicated that there existed little relationship between any of the aspects of high school science preparation measured and academic success in college. However, it was concluded that the method of evaluating and quantifying quality needed refinement by means of subsequent research. It was suggested that a refined method of quality evaluation might lead to a means of evaluating instructors and curricula.

CHAPTER I

GENERAL DESCRIPTION OF THE STUDY

For many years educators have been attempting to isolate a single factor of preparation that has a high degree of relationship with academic success in college. A student's success in college is generally considered to be dependent on many factors. Such factors as test scores, grades, and numbers of courses have been measured and the degree of correlation with academic success has been determined. In general the results have not been gratifying. Quality of instruction has long been considered of premier importance in preparing a student for college, but there appear to be no studies measuring quality of instruction and subsequent determinations of its affects on academic success in college.

I. STATEMENT OF THE PROBLEM

It was the purpose of this study to (1) define quality of high school science instruction; (2) to measure quality of high school instruction received by a group of twenty students; and (3) to measure the relationship of this instruction to academic success in college. It was hypothesized that there existed a stronger relationship between quality of preparation and academic success in college than between quantity of preparation and academic success.

II. IMPORTANCE OF THE STUDY

Methods of instruction are deemed of considerable importance in the educational process; as witnessed by the popularity and numbers of normal schools and departments of education. Yet measurement of the quality of instruction has long been disregarded. It has been extremely difficult for educators to give accurate answers to questions regarding effects of instruction on academic success. It was the intent of this study to provide answers to the above questions. Also it was anticipated that this study might provide some basis for making evaluations of instructors and teaching methods.

III. LIMITATIONS OF THE STUDY

Evaluation of instruction in only science courses was considered. Science courses included Mathematics, Chemistry, Physics, and Biology. Other areas such as History, English, Social Science, Art, Shop, and Physical Education were not considered as the author did not feel competent to make quality evaluations in these areas.

Quality of instruction evaluations were based on student responses to selected questions. The evaluations were also based on this author's scientific and educational background, and are not to be considered final or unique.

CHAPTER II

REVIEW OF LITERATURE

A review of literature led to an examination of two distinctly different areas that were deemed pertinent to this study. One area was comprised of research studies that measured the degree of relationship between various aspects of preparation and academic success. The other area examined dealt with philosophic discussions of educational methodologies.

I. LITERATURE EXAMINING RELATIONSHIPS BETWEEN PREPARATION AND ACADEMIC SUCCESS

Studies that are included in this section are examples of work that has been done in attempting to find a correlation between some measurable aspect of preparation and academic success. Since most of the studies examined were of the same theme, only several of the more pertinent are included as examples.

Research Studies Measuring Correlations

Cantwell (1966, p. 28-31) measured the correlations between results on two abstract tests and academic success. The two abstract tests were the Standard Progressive Matrices (1938) and the D. 48 Test Of Non-Verbal Intelligence. The Progressive Matrices Test consisted of problems of varying degrees of abstraction based on matrices, and the D. 48 Test consisted of domino problems that progressed from simple

to complex. These two tests were administered to various groups of college freshmen (men and women), and then the correlations between the scores on these tests and the scores on the SAT-Verbal, SAT-Mathematics, and High School Grade-Point-Average were computed. The highest correlation coefficient that was obtained between his two tests and the three measures of academic achievement was .57 and the lowest was .32. Cantwell concluded that neither the P. M. (1938) nor the D. 48 seemed to be highly valid indicators of general academic achievement.

Another group of studies that were examined were those where correlations between a pre-test score in a subject area and grades actually obtained in that subject area were determined. Waggoner (1964, p. 271-5) examines the results of a mathematics pre-test as related to grades obtained in his mathematics course. He took 340 students who had enrolled in certain mathematics courses a Central Michigan University and subjected them to a pre-test of mathematical knowledge which consisted of forty problems. Each of the mathematics courses had certain minimal prerequisites and those students who were one standard deviation below the mean after testing were allowed to register for a mathematics course with less prerequisites.

His results showed that of the sixteen students who changed to a course with less prerequisites, five failed, ten received a D, and one received a C. Of the five who were one standard deviation below the mean but who stayed in the class, one received an F, three received a D, and one received a C. Correlations between pre-test scores and semester grades were low. There was little difference on the pre-test

whether the student had taken the prerequisites in college or high school. However, there was a reasonable correlation between total high school mathematics units and pre-test scores, but he did not list the exact magnitude of the correlation.

A study by Cashen (1967, p. 5-8) circumvents all tests, and quite simply measures correlations between predicted and achieved grades. Seventy-six college freshmen (men and women) in a general psychology course were asked to predict their grade point average. Also, the respective parents and counselors of these students were asked to predict the grade point average of their students. The correlations between predicted and achieved grade point average for the students, parents, and counselors were 0.5443, 0.6010, and 0.5867, respectively. It was found that although the groups were fairly consistent in their predictions, that each group tended to overestimate success. The students and counselors had closer agreement in predictions, whereas the parents tended to slightly overestimate these predictions.

A Study Analyzing Previous Research Work

Burnett (1966, p. 1-16) wrote a paper discussing studies that dealt with the relationship between aspects of high school preparation and academic success in college. His study entailed an examination of a considerable portion of the literature between 1923 and 1964. In his paper he examined a representative portion of the literature on the subject and included findings from twenty-five various articles. He presented abstracts of, and quotations from these articles. In

his report, he said, "Although not all of the writers are agreed, the preponderance of research in these studies indicates that there is little or no significant relationship between specific patterns of high school units and academic success in college.". He further supports his view by the findings of the study sponsored by the Progressive Education Association and referred to in the literature as the Eight-Year Study or the Thirty Schools Experiment. Also mentioned was the fact that World War II veterans who did not have a high school diploma were admitted to college on the basis of successful scores on the GED Tests and that many of them did succeed in college.

Burnett concludes his paper by listing several implications from these studies. He mentions that colleges place too much emphasis on a specific pattern of high school units for college admission and that better research designs need to be constructed to test this problem. For instance the individual college should enter into a cooperative arrangement with the high schools from which it receives large numbers of graduates.

II. QUALITY OF EDUCATIONAL TRAINING DISCUSSED BY VARIOUS PHILOSOPHICAL SCHOOLS

Weber (1960, p. 1-310) in his book on the philosophy of education, discusses various philosophic schools of thought and their relationship to education. Of particular interest in his book was how some of the various philosophies would affect teaching methodology, and how these would define a quality education.

For example the idealists would have certain criteria that they considered good or necessary in an educational program. For the idealist questioning and discussion would be an important part of the educational process. This would be used to cultivate the student's judgment. Of course this is intelligent discussion with a purpose. The lecture method would also be incorporated, but it would be utilized only when necessary to convey objective information, or to provide counsel. Another important teaching method would be the project, in which students singly or in groups, carry out experimentation and observation by themselves.

The pragmatists would obtain a quality education by relying primarily on student experience. Creative and constructive projects, conducted both in and outside of the classroom would be the major method. Discussion and acquisition of facts are deemed of importance but in a position second to the project. Also, it should be mentioned that both the pragmatists and idealists would place considerable emphasis on training the students to live in society. This is their primary objective and its attainment would naturally influence their methodologies. For instance, the concept of democracy would be carried through all courses. Chemistry would be learned through discovery, but the students would be asked to share their ideas with the total group and to respect other ideas and discoveries. Then by "pooling" their separate knowledge, the social group would be able to form a general idea agreeable to the whole group. Naturally, in this study, we are not concerned with a philosophical objective such as social training,

but we are concerned with methodologies for obtaining quality science training. The above example illustrates how a philosophical objective can influence methodology.

Another important methodology would be that proposed by the existentialists. They would be quite similar to the pragmatists in that they would employ the inquiry, or project method. But what is extremely important to the existentialist would be individual study. In fact, group meetings and sharing of ideas would be of minor importance. For them knowledge has an internal value rather than an external value as per the pragmatists. It has a special meaning to each person which is necessarily different from a group consensus; therefore there would be no use for the group per se.

III. SUMMATION OF LITERATURE REVIEW

Although the literature reviewed was in two quite different areas, it was possible to accomplish two important purposes by this review. First it was possible to rationalize separating quality of preparation from quantity of preparation and treating quality as a separate variable. Secondly it was possible to obtain a general definition of quality.

Rationalization Of Quality

After making a representative but not necessarily exhaustive review of the literature available on the relationship of high school preparation to academic success in college, it was noted that there was considerable question as to how exactly this relationship could be

measured. From the studies described in the previous unit, it can be seen that there has been little success in measuring a relationship. Cantwell (1966, p.31) found little correlation between his test and the SAT-Verbal and SAT-Mathematics. Waggoner (1964, p.275) found that less than two-fifths of the variation in pre-test scores was explained by high school mathematics. Cashen (1967, p. 8) found that neither parents, counselors, nor students were too accurate at predicting academic success. Next Burnett (1966, p. 4) concluded quite succinctly, that there was"little or no significant relationship between specific patterns of high school units and academic success in college".

Finally the Montana State University Bulletin (1966, p. 76) states that five and one-half units of high school science and mathematics are necessary for enrollment in the College Science Curricula. Immediately one questions the basis on which these requirements were predicated. There seems to be a glaring inconsistency between the researchers in the area and those formulating entrance requirements.

In view of this inconsistency, or in stronger terms, dilemma, it seems that a different approach is necessary. Burnett (1966, p. 4) states, "Better research designs need to be constructed to test this problem.". Perhaps as Burnett (1966, p. 4) mentions, "Academic success in college may be a function of individual intelligence, motivation, value pattern, and work skills rather than completion of a certain number of units in subject matter fields.". Therefore if we are to find a relationship, it will lie in correlating some other variable or

factor of high school preparation. Not just quantity or pattern of high school units. For this study, quality of preparation has been selected as the other variable.

A General Definition Of Quality

From the discussion of methodologies in the previous unit it is possible to give a prescriptive definition of quality. It should be noted that this definition of quality will be by no means final or unique. The intent is to obtain a reasonable definition that can be utilized in measurement. A general definition of this term simply stated by Barzun (1959, p. 30) is "learning the basic concepts and vocabulary of a particular area".

A course will be assumed to have quality if it satisfies certain criteria. First the course must stress learning of the basic vocabulary necessary in the field. Basic vocabulary means terms and ideas in common everyday usage. Not every term, equation, reaction, principle found in a particular field. Secondly it is problem oriented, perhaps best represented by directed laboratory work or directed problem solving. This means having students work either individually or in small groups on projects. This would involve library research and independent observations and conclusions. In other words the instructor places the burden of learning on the student. Thirdly there is group discussion and analysis of the observations and solutions, where the teacher acts as more of a moderator or reference source. Lecturing would be considered necessary, if it did not answer all of the possible questions and did not take up all of the time.

Next, to look at the other end of the continuum, we should state a brief discription of lack of quality. A lack of quality might be characterized by undirected or so-called 'creative' laboratory work, 'cookbook' laboratory work, overemphasis on memorizing unrelated facts, major portion of time spent in lectures, and little consideration given to basic concepts.

CHAPTER III

MEASUREMENT OF QUALITY

Altogether twenty-one interviews were conducted. There was first a trial interview to test the practicality of the interview technique. Results of this preliminary interview led to a final interview format that was used in interviewing the twenty other students. Results from the preliminary interview were not included in the calculations made on the data obtained from the other twenty. Students for all of the interviews were selected on a volunteer basis from freshman chemistry laboratory groups. The interviews were conducted in any vacant room near the chemistry laboratory or in the Student Union Building.

I. INTERVIEW FORMAT

The discussion of quality in the previous chapter has led to a general definition of quality preparation. Next a series of questions were formulated; the responses to which described the quality of preparation that a student had obtained in high school. These questions were not completely formulated until after the result of the preliminary interview had been analyzed. In this section are presented the general questions asked and the final interview format.

General Questions Presented

Most of the questions were general and were supplemented with further conversation. The intent was to examine four aspects or areas

of a student's high school science preparation. One area pertained to the 'quantity' of a student's preparation, and the other three pertained to 'quality' aspects. Each of these areas is treated separately below. These areas may be considered as groups of questions.

Quantity of preparation was measured by asking the student to state the high school and college, science and mathematics courses that he had attended. He was also asked to state the grades he had obtained for each of these courses.

Three quality aspects of preparation measured were laboratory work, regular class work, and extracurricular class work. Evaluations of laboratory work were accomplished by asking the student to describe how much laboratory work each course contained and exactly how it was presented. The student was asked if he thought the laboratory work to be of the "cook book" variety.

An evaluation of 'regular' class work was obtained by asking questions pertaining to memorization, retention, and transferance of the material. Also specific questions were asked concerning mathematics courses. Students were asked to differentiate between Euclidian and non-Euclidian or Synthetic Geometry. They were asked to define a mathematical model, and basic rules of Algebra. They were asked to, approximately, state how much time was spent in each class listening to lectures.

Extracurricular class work was evaluated by asking questions pertaining to quantity and types of research work or special problems.

Also the amount of time spent from regular class time for discussion of extracurricular work and related problems was determined.

A listing of the general questions that were presented to the students is given in Table I, page 15. It is also noticed in Table I that there is a grouping of the questions. Group "A" contains questions relating to quantity of preparation. Group "B" contains questions relating to laboratory work. Group "C" questions relate to regular class work, and Group "D" to extracurricular class work.

The intent of most of the questions is readily apparent. However, the questions regarding the Geometries and Algebras may need further explanation. These are questions nine through eleven from Table I. Question nine seeks a general evaluation of the Geometries. The Euclidian method or approach to geometry relies heavily on memorization and lecture. It primarily involves memorization of axioms, postulates, proofs, and subsequent regurgitation. Non-Euclidian or Synthetic Geometry relies on individual derivations and little memorization. This latter approach is flexible enough to allow for a considerable variety of derivations.

The second part of question nine has two purposes. For those pupils who have not had Synthetic Geometry it should indicate the unawareness of such a basic mathematical concept as the 'model'. For those who have had the synthetic approach it should be interesting to see how the 'model' is conceived.

Question eleven is specifically designed for the Algebra courses. The old approach to Algebra emphasizes memorization. With the newer

TABLE I GENERAL INTERVIEW QUESTIONS

Group A

1. What Mathematics and Science courses did you take in high school?
2. What were your grades in each of these?
3. What college Mathematics and Science courses have you taken or are presently taking?
4. What were/are your grades in these college courses?

Group B

5. Did you have much laboratory work in your high school science courses?
6. Was your laboratory work of the 'cookbook' variety?

Group C

7a. Did you have to remember a lot of facts and figures; such as reactions, names and formulas?
7b. Do you think much of this material has stayed with you? Has the material aided you in your college courses?
7c. Do you think that all of this memorization was necessary?
8. Did your instructors assign many problems? Did you find that they represented various different situations where the material pertained?
9a. In your Plane and Solid Geometry and Trigonometry courses, did you have to memorize proofs and theorems or did you synthetically derive them?
9b. Do you know what a mathematical model is?
10. What types of problems were you assigned?
11a. Did you have to memorize rules of Algebra or did you derive most of them?
11b. Did you do many Algebra problems?
12. In all of your courses, how much time did your instructors spend lecturing to classes?

Group D

13. Did your instructors assign outside research work in any of your courses?
14. Did your instructor ask you to work on special projects rather than assign them? In other words did you have a choice?
15. Did you spend much time in any of your courses, in class discussion of research work or special problems?

approach considerable emphasis is placed on number theory and individual derivations of theorems. The new theory assumes that most laws are natural and logical consequences of basic principles and encourages students to find them on their own.

Final Interview Format

From answers to the above questions it was possible to obtain a reasonably complete description of the quality and quantity aspects of a student's high school science training. They were augmented with further conversation to make the interview as comfortable and profitable as possible. However, the questions and answers, alone, would not yield a statistically manageable result. Therefore it was decided to assign numbers to quality evaluations, and to prepare a data sheet for each student.

Each science course that a student had attended in high school was evaluated on the basis of his responses to the questions prefaced above. The number "0" designated a complete lack of quality and the number "10", total quality. The nine numbers between designated varying degrees of quality. A quality rating-number was assigned to each of the groups of questions mentioned before and presented in Table I, page 15. Group "A" was naturally excluded, as the questions in this group pertained to quantity factors. Groups "B" through "D" pertained to quality and were included.

All data pertaining to quantity and quality of preparation were recorded on data sheets. The form used is presented in Figure 1, page 17.

DATA SHEET

Subject_____
Date _____
Curriculum_____

Time (start)_____
Time (end) _____

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry							
Physics							
Biology							
Adv. Biology							
Plane Geometry							
Solid Geometry							
Trigonometry							
Algebra I							
Algebra II							
Adv. Mathematics							
Totals							
Averages							

Comments:

Figure 1. Form used for recording of interview data.

Columns one and two, starting from the left, contain the courses and grades for each of the respective courses. These are quantity factors. Columns designated "B", "C", and "D" contain the quality evaluations for each of the courses. The next column contains the average of the two or three quality ratings for each course. The last two columns contain the college science courses and the grades obtained in each respective course. The latter column is considered to be a measure of academic success. Appropriate spaces are provided at the bottom of each column for totals and averages.

This final interview format was used in all but the first or preliminary interview. Use of this final form permitted all interview data to be placed on one sheet for handy reference. It was also decided after the preliminary interview to provide a space for general comments. These comments provided a basis for further evaluations of the student's background.

II. INTERVIEW RESULTS

Discussed in the preceeding section was the interview format that was used in twenty interviews. A considerable volume of statistical data was obtained as a result of these interviews. However, only the more significant results are presented in this section.

Most of the students interviewed were quite relaxed and appeared to be quite eager to discuss their high school science background. Little hesitancy was shown in discussing grades. The only difficulty encountered was having the students discuss all of their courses.

Certain courses and instructors were recalled extremely well, whereas it took considerable questioning to obtain a description of some of the other courses. Each student had particular courses that he liked and consequently could describe very well. In general, it seems that freshman and sophomore courses were least remembered. It was possible to obtain a thorough description of 'favorite' junior courses and all senior courses, whether or not the student liked the course.

Presentation And General Discussion Of Raw Data

The intent here was to prepare the raw data for later calculations of relationships between quantity and quality factors. Both quantity and quality aspects of a student's background were measured. Results of the twenty interviews are presented in the Appendix, pages
Data from the interview sheets were condensed by computing totals and averages for each of the quantity and quality factors. Each of the interviews led to four figures that were a measure of the quantity and quality aspects of each student's science background.

Total time of the twenty interviews was approximately 950 minutes or 15.8 hours. The longest interview was seventy-five minutes and the shortest was twenty-five minutes. Mean and median time for each interview was approximately forty-eight minutes.

High school science grade-point-average and number of science courses attended were considered indicative of a student's quantitative background. College science grade-point-average was considered as a measure of a student's academic success. Table II, page 20 presents a

TABLE II

AVERAGES OF QUANTITY FACTORS

Subject	College Science GPA*	High School Science GPA*	Number of High School Science Units
1	3.2	3.0	7
2	2.3	2.6	5
3	2.3	2.5	4
4	2.4	2.6	8
5	2.5	3.2	4
6	2.4	3.0	6
7	2.1	2.5	4
8	2.7	2.8	4
9	2.3	2.9	8
10	2.5	2.3	3
11	3.1	3.8	8
12	3.2	2.8	5
13	2.1	3.3	7
14	2.2	3.0	5
15	3.4	3.4	8
16	3.4	3.1	7
17	2.0	2.4	7
18	2.5	2.7	7
19	3.1	3.5	11
20	3.3	3.6	8

*GPA- Grade-point-average, A=4.0, B=3.0, C=2.0, D=1.0, F=0.0

tabulation of the quantity factors and the values measuring academic success. In the second column from the left is a listing of the college science grade-point-averages for the twenty students. There was a high of 3.4, a low of 2.0 and a median of 2.5. In the next column to the right were listed the high school science grade-point-averages. Here was found a high of 3.8, a low of 2.3, and a median of approximately 3.0. The fourth column contains a listing of the number of high school science units that each student had acquired. There was a high of eleven courses, a low of three courses, and a median of seven courses. Eleven of the students had acquired seven or more science units.

Averages of quality ratings and the number of quality ratings greater than 5.0 were the final quality factors determined in this study. For each student a single average quality rating was determined by taking an average of all quality ratings assigned to each of the courses. Since each course had three areas where a quality evaluation could be made and each student had at least three science courses, there was a possibility of nine single quality evaluations that were considered in the determination of an average quality rating. For example, the student that had eleven science courses had a possibility of thirty-three separate quality evaluations. However, he had only twenty-seven quality evaluations. The reason for twenty-seven instead of thirty-three is because the mathematics courses had no laboratory evaluations. Mathematics courses had only class room and extracurricular evaluations (groups "C", and "D").

Another quality factor was the number of quality ratings greater than 5.0. All evaluations for each interview were examined and the number of evaluations greater than 5.0 were determined. For example the student who had eleven science courses also had eleven quality evaluations greater than 5.0. A student who had eight science courses had thirteen evaluations greater than 5.0.

Table III, page 23 presents the quality factors discussed above. It can be seen that for the average quality ratings there is a high of 5.9, a low of 3.1, and a median of 4.4. For the number of ratings over 5.0 there is a high of 13, a low of 0, and a median of 5.5.

Interpretation Of Interview Results

The data presented in Tables II and III, pages 20 and 23, respectively, were next subjected to a statistical analysis. This analysis attempted to determine the degree of relationship between quantity and quality factors and academic success. Correlation coefficients were computed and are discussed in this section. Computational formulas for determining correlation coefficients are given in Ferguson's (1959, pages 111, 396) statistics book. Both single and multiple correlations were determined.

Single correlations consisted of correlating one quantity or quality factor with academic success in college. Quantity factors correlated to academic success were high school grade-point-average, and the number of high school science units. Quality factors correlated to academic success were average quality ratings, and the number of

TABLE III

AVERAGES OF QUALITY FACTORS

Subject	Quality Ratings	Ratings Over 5.0 (number of)
1	5.1	9
2	5.5	6
3	3.2	0
4	4.4	3
5	4.0	4
6	4.6	6
7	4.0	4
8	4.2	4
9	4.4	7
10	3.6	1
11	5.3	11
12	3.9	5
13	5.5	9
14	4.7	7
15	5.7	9
16	4.2	5
17	3.1	0
18	3.6	3
19	4.5	11
20	5.9	13

ratings greater than 5.0. Four separate correlation coefficients were determined.

Table IV, page 25 lists the single correlation coefficients that were determined. The quantity and quality factors were the independent variables and academic success was the dependent variable. High school science grade-point-average correlates better with academic success than any of the other independent variables. It can be interpreted that high school grade-point-average is a better single predictor of college science success than any of the other three variables; whether it be a quantity or quality variable. The correlation coefficient here was +0.60. The next best predictor of academic success was the number of quality ratings greater than 5.0. A correlation coefficient of +0.55 was determined and it differed from correlation of high school grade-point-average by only 0.05 correlation units.

Neither the number of high school science units taken nor the average quality ratings correlate well with college science grade-point-average. Correlation coefficients for the two independent variables were +0.41 and +0.40, respectively. Both correlation coefficients are quite low, and it is only coincidental that they are so nearly equal. The low correlations indicate that other factors, singly or combined, are more important in determining academic success in college science courses. Motivation, intelligence, and maturity are certainly worthy of consideration.

Selected combinations of two independent variables were correlated

TABLE IV

ONE INDEPENDENT VARIABLE
CORRELATED TO ACADEMIC
SUCCESS IN COLLEGE

Independent Variable	Correlation Coefficient
1. High School GPA	+0.60
2. Number of high school science units	+0.41
3. Average Quality Ratings	+0.40
4. Number of ratings over 5.0	+0.55

to academic success. Combinations of more than two independent variables were considered to be meaningless. By computing multiple correlations, the correlation coefficients were found to approximate +0.60.

Table V, page 27 presents the results of the multiple correlation computations. Combining the number of high school science units and the number of quality ratings over 5.0 leads to a correlation coefficient of +0.56. This means that we have no better a predictor of academic success by knowing both number of high school science units and number of quality ratings over 5.0 than we do by knowing only the number of quality ratings over 5.0. However, by combining the quantity factor, number of science units, and the quality factor, ratings over 5.0, we have a better predictor of academic success than just the quantity factor alone.

By considering both number of high school science units and the average quality ratings, it is possible to obtain a correlation coefficient of +0,55. A knowledge of both of these factors appreciably increases the prediction of academic success over knowing only one or the other. An increase of approximately 0.15 correlation units is observed. In terms of variance, successful prediction is increased from 16% to 30%. The reason for this increase in prediction is because the number of science units and the average quality ratings are measures of two different aspects of high school science preparation. Combined they represent a more complete description of high school science preparation.

TABLE V

TWO INDEPENDENT VARIABLES
CORRELATED TO ACADEMIC
SUCCESS IN COLLEGE

Independent Variables	Multiple Correlation Coefficient
1. Number of high school science units plus the number of ratings over 5.0	+0.56
2. Number of high school science units plus average quality ratings	+0.55
3. High school GPA plus the average of quality ratings	+0.60
4. High school GPA plus the number of ratings over 5.0	+0.60

Combining the high school grade-point-average and the average quality ratings leads to a correlation with academic success of +0.60. Also combining high school grade-point-average with the number of quality ratings greater than 5.0, leads to a correlation coefficient of +0.60. A knowledge of the high school grade-point-average and either of the quality factors did not increase the prediction of academic success. The high school grade-point-average alone would be sufficient.

It is indicated from the data that high school grade-point-average and number of ratings over 5.0 are measures of approximately the same thing. This can be interpreted to mean that the higher a student's grades in high school, the better are his chances of being placed in advanced or specialized courses. These courses will probably be better taught and consequently may be given a high quality rating. Then in turn, the student acheives a higher grade and the cycle begins anew. This would account for the high correlation between high school grade-point-average and number of courses with a quality rating over 5.0.

Referring to the table of t in Ferguson (1959, page 413) it is found that the significance of all the correlation coefficients in Tables IV and V is above the ten percent level. In fact all but the correlations of +0.40 and +0.41 are significant at the two percent level. This means that there is at least a ninety percent chance that all the correlations are representative of a larger group. And further, in all but the two cases mentioned above there is a ninety-eight percent chance that the correlations are representative.

A brief variance analysis allows one to better conceptualize the degree of relationship represented by the various correlation coefficients. For instance a correlation coefficient +0.40 represents a sixteen percent association and a correlation coefficient of +0.60 represents a thirty-six percent association. The correlation between college science grades and high school grades was +0.60. This means that at best only thirty-six percent of the variance in college science grade-point-average was predictable from the variance in high school grade-point-average. Then sixty-four percent of the variance in college science grade-point-average may be attributed to other sources. Similarily, eighty-four percent of the variance in college science grade-point-average may be attributed to sources other than average quality of preparation. Therefore, although these correlations are representative, they indicate little relationship between the variables measured and academic success in college. Again motivation, maturity, and intelligence would probably be major factors in determining academic success.

CHAPTER IV

CONCLUSIONS

There are two primary conclusions that can be drawn from this study. First, it is indicated that quality of high school preparation can be defined and measured. Secondly, it is concluded that the hypothesis be rejected. There is not a stronger correlation between quality of preparation and college success, than between quantity of preparation and college success. The following discussion will elaborate on these two conclusions.

Results of this study indicate that it is possible to set up a list of criteria that define quality of preparation. A student's high school preparation can be examined by a brief interview, and rated according to how well it satisfies these criteria. It must be kept in mind that the criteria tested will be dependent upon the teaching methodology in question. At the present time there are several different methods of teaching in current use. Each of these methods would yield different criteria that would describe quality. This study has simply shown how quality of preparation can be measured for any set of criteria that are chosen. It is entirely deyond the scope of this study to consider all the methods being practiced today.

The fact that the statistical results lead to rejection of the hypothesis is significant, but certainly not discouraging. By examining the data it can be seen that the quality ratings are the ones most subject to suspicion from a statistical viewpoint. Quantity factors

such as number of courses and grades can be considered true values.

Average quality ratings listed in Table III, page 23 show little variability. This naturally tends to decrease the correlation coefficient, in view of the variability of college grades. An analysis of covariance as utilized in this study, does not have a control group and is therefore dependent on internal controls. This means that a representative sample should exhibit values from the entire range possible. In this case zero to ten. If this entire range is not represented or at least approximated, say values from one to nine, then either the sample is atypical or the population distribution is skewed. Since only college students were interviewed, it can be assumed that the population distribution would exhibit some positive skewness, but not nearly as much as the twenty samples of this study indicate. Therefore, without any more knowledge of the distribution of the population, we must conclude that the sample is atypical.

Assuming this to be the case, the correlations that were computed are not valid. The formulas used for computation of the correlation coefficients are based on normal populations. If the population from which the sample is drawn does not approximate a normal bell-shaped distribution, then further knowledge of the total population is required. This leads to a possible solution for increasing the accuracy of future studies. Quite simply, the sample size must be increased. This increase may or may not increase the correlation coefficient. Certainly it will lead to a more accurate estimate of the relationship between quality of preparation and academic success.

Another suggestion is to increase the range of the quality ratings by altering the evaluation procedure. More emphasis should be placed on relative evaluations. This means that the interviewer must rate the quality of preparation in terms of the criteria and in terms of the other subjects. This naturally places more responsibility with the interviewer, and requires him to gain some experience in making quality ratings. Approximately fifteen to twenty interviews are necessary to provide the interviewer with sufficient experience to make proper evaluations. These preliminary interviews need not be discarded as worthless information. If they are conducted over a short enough time, say a week, they can be re-evaluated and considered worthwhile data. This should yield a greater range of evaluations. Also this will help to make the sample approximate a normal distribution.

By making the above mentioned improvements in sampling, it should be possible to increase the accuracy of the quality evaluations and the subsequent correlation coefficients. Hopefully these improvements will also increase the magnitude of the correlation between quality of preparation and academic success.

If the accuracy of the results can be improved, it will then be possible to consider the quality aspects of a number of areas in our educational process. For instance, regardless of the magnitude of the correlation, it will be possible to examine the quality of training that high school students are receiving. Most important, this will be quality as viewed through the student; not as viewed in a text or

abstract theory. If the magnitude of the correlation coefficient varies according to methodology, particular school, or particular instructor, there will be an objective means for rating these factors. This will provide a basis for merit evaluations of methods, schools, and instructors.

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APPENDIX

DATA SHEET

Subject #1
Date 18 April
Curriculum Mathematics

Time (start) 2:45 P. M.
Time (end) 4:00 P. M.

High School Course		Grade	Evaluation				College Course		Grade
			B	C	D	Average			
Chemistry		B-3	2	6	5	4.3	Chemistry 131		B-3
Physics		C-2	2	7	7	5.3	Chemistry 132		B-3
Biology		B-3	5	6	6	5.7	Physics 227		B-3*
Adv. Biology							Math 131		B-3
Plane Geometry		C-2		7	7	7.0	Math 132		A-4
)))) Solid Geometry							Math 133		B-3*
Trigonometry		A-4		7	7	7.0			
Algebra I		A-4		5	1	3.0			
Algebra II		B-3		5	2	3.5			
Adv. Mathematics									
Totals	7	21	9	43	35	35.8		6	19
Averages		3.0	3.0	6.1	5.0	5.1			3.2

*Anticipated grade

Comments:

This student seemed to view his high school background quite favorably. He said that he had the same instructor for both Geometry and Trigonometry. This instructor made quite an impression on the student and most likely was instrumental in his majoring in Mathematics. He could only vaguely recall his Algebra courses, so they were given more or less average ratings. This student This student was given considerable "outside of Class" assignments, in most of his courses. He seemed to enjoy them and commented about them in great detail. His lab work left quite a bit to be desired as it was completely of the "cookbook" variety. He said that before coming to college he did not really know what the scientific method was nor what a mathematical model was.

DATA SHEET

Subject #2
Date 19 April
Curriculum Agriculture

Time (start) 3:00 p. m.
Time (end) 3:50 p. m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 121	D-1
Physics						Chemistry 122	C-2
Biology	B-3	6	6	5	5.6	Chemistry 134	C-2*
Adv. Biology						Math 114	C-2
Plane Geometry	C-2		5	5	5.0	Math 116	B-3*
Solid Geometry	C-2		6	8	7.0	Animal Science	B-3
Trigonometry	B-3		6	7	6.5	Plant Science	B-3
Algebra I	B-3		5	2	3.5		
Algebra II							
Adv. Mathematics							
Totals 5	13	6	28	27	27.6	7	16
Averages	2.6	6	5.6	5.4	5.5		2.3

*Anticipated grade

Comments:

The Trigonometry evaluations are significant. He had an instructor who had the students do several surveying projects to emphasize the practicality of Solid Geometry and Trigonometry. Excellent approach!

DATA SHEET

Subject #3
Date 23 April
Curriculum General Studies

Time (start) 1:30 p.m.
Time (end) 2:10 p.m.

High School Course		Grade	Evaluation				College Course		Grade
			B	C	D	Average			
Chemistry		C-2	2	5	1	2.7	Chemistry 121		C-2
Physics							Chemistry 122		C-2
Biology		B-3	5	5	5	5.0	Chemistry 134		B-3*
Adv. Biology									
Plane Geometry		C-2		4	1	2.5			
Solid Geometry									
Trigonometry									
Algebra I		B-3		4	1	2.5			
Algebra II									
Adv. Mathematics									
Totals	4	10	7	18	8	12.7		3	7
Averages		2.5	3.5	4.5	2.0	3.2			2.3

*Anticipated grade

Comments:

Student seemed to be oriented more towards liberal arts than science. He said that his high school Chemistry course was strictly the 'cookbook' variety, with very little work assigned. He felt that it was pretty much a waste of time. His Algebra sounded rather dull too. He was quite brief and rather vague in his descriptions.

DATA SHEET

Subject #4
Date 23 April
Curriculum Mechanical Engineering

Time (start) 3:00 p.m.
Time (end) 3:40 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	C-2	5	5	1	3.7	Chemistry 131	C-2
Physics	B-3	7	7	4	6.0	Chemistry 134	B-3*
Biology	C-2	5	5	5	5.0	Math 121	C-2
Adv. Biology						Math 122	C-2
Plane Geometry	B-3		7	4	5.5	Math 123	B-3*
Solid Geometry	A-4		5	5	5.0		
Trigonometry	C-2		5	1	3.0		
Algebra I	C-2		5	2	3.5		
Algebra II	B-3		5	2	3.5		
Adv. Mathematics							
Totals 8	21	17	44	24	35.2	5	12
Averages	2.6	5.6	5.5	3.0	4.4		2.4

*Anticipated grade

Comments:

Plane Geometry taught from the synthetic approach, but little outside work. The Trigonometry course sounded particularly bad. Regular lectures and assignments with no actual practice or use of the material aside from 'book' problems. He mentioned that he took two years of drafting and thoroughly enjoyed it. His Physics was his best remembered science course. The labs sounded especially challenging.

DATA SHEET

Subject #5
Date 30 April
Curriculum Agriculture

Time (start) 3:00 p.m.
Time (end) 4:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 121	B-3
Physics						Chemistry 134	C-2*
Biology	B-3	6	6	1	4.3	Math 114	B-3
Adv. Biology						Math 116	C-2*
Plane Geometry	A-4		7	6	6.5	Animal Science	B-3
and)))) Solid Geometry						Plant Science	B-3
Trigonometry							
Algebra I	B-3		4	1	2.5		
Algebra II	B-3		4	1	2.5		
Adv. Mathematics							
Totals 4	13	6	21	9	15.8	6	16
Averages	3.2	6	5.2	2.3	4.0		2.5

*Anticipated grade

Comments:

Plane Geometry taught from the synthetic approach. Said that he liked it a lot. Algebras were boring. Biology low in "D" due to no outside work at all, but well compensated for by good lab and lecture.

DATA SHEET

Subject #6
Date 2 May
Curriculum Electrical Engineering

Time (start) 2:15 p.m.
Time (end) 3:10 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 131	C-2
Physics	A-4	8	8	7	7.7	Chemistry 134	B-3*
Biology	C-2	5	5	2	4.0	Math 121	B-3
Adv. Biology						Math 122	D-1
Plane Geometry	B-3		6	4	5.0	Math 123	B-3*
Solid Geometry and Trigonometry	B-3		6	6	6.0		
Algebra I	C-2		4	1	2.5		
Algebra II	A-4		4	1	2.5		
Adv. Mathematics							
Totals 6	18	13	33	21	27.7	5	12
Averages	3.0	6.5	5.5	3.5	4.6		2.4

*Anticipated grade

Comments:

For this student Physics was the course. Most of the interview was spent in discussing this course and the instructor. The lab work was experimental in nature and there was considerable attention given to outside projects. He seemed a bit reluctant to talk about his Math courses. From the discussion though, it was possible to rate his Geometry and Trigonometry courses as being quite good. Regarding Trigonometry he mentioned that the class had a project that involved surveying with a transit. This makes for a fine class project and gives the students a real opportunity to use Trigonometry.

DATA SHEET

Subject #7
Date 3 May
Curriculum Agriculture Science

Time (start) 2:35 p.m.
Time (end) 3:20 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	B-3	6	6	2	4.7	Animal Science	B-3
Physics						Plant Science	C-2
Biology	B-3	6	6	4	5.3	Chemistry 131	C-2
Adv. Biology						Chemistry 132	D-1
Plane Geometry	C-2		5	1	3.0	Chemistry 134	B-3*
and)))) Solid Geometry						Math 114	C-2
Trigonometry						Math 115	C-2
Algebra I	C-2		5	1	3.0		
Algebra II							
Adv. Mathematics							
Totals 4	10	12	22	8	16.0	7	15
Averages	2.5	6	5.5	2.0	4.0		2.1

*Anticipated grade

Comments:

Vague memory of high school Algebra and Geometry. They were taught by the traditional and Euclidian approach. His Chemistry lab and lecture were quite good, but he said that there was little outside work assigned; aside from regular homework.

DATA SHEET

Subject #8
Date 7 May
Curriculum Nursing

Time (start) 3:20 p.m.
Time (end) 4:10 p.m.

High School Course		Grade	Evaluation				College Course		Grade
			B	C	D	Average			
Chemistry		B-3	2	5	3	3.3	Chemistry 121		C-2
Physics							Chemistry 122		B-3*
Biology		B-3	6	5	6	5.7	Zoology 112		B-3*
Adv. Biology									
Plane Geometry		C-2		6	6	6.0			
and))))) Solid Geometry									
Trigonometry									
Algebra I		B-3		3	1	2.0			
Algebra II									
Adv. Mathematics									
Totals	4	11	8	19	16	17.0		3	8
Averages		2.8	4.0	4.8	4.0	4.2			2.7

*Anticipated grade

Comments:

This student's attitude towards science was definitely unfavorable. She said that the only reason she wasable to get a C and B in college Chemistry was through considerable work and tutoring from friends. Her high school Chemistry was described as dull and boring and the manner in which she described it; this was probably so. She seemed to think Geometry was 'alright', but upon discussion of it, it was evaluated as quite good due to the synthetic approach. She thoroughly enjoyed Biology due primarily to the outside projects and lab work.

DATA SHEET

Subject #9
Date 9 May
Curriculum Civil Engineering

Time (start) 9:55 a.m.
Time (end) 10:45 a.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	A-4	5	7	6	6.0	Chemistry 131	C-2
Physics	C-2	4	4	1	3.0	Chemistry 132	C-2
Biology	B-3	6	7	7	6.7	Chemistry 134	B-3*
Adv. Biology						Math 121	D-1
Plane Geometry	B-3		6	2	4.0	Math 122	B-3
Solid Geometry	C-2		5	2	3.5	Math 123	B-3*
Trigonometry	A-4		7	5	6.0		
Algebra I	C-2		5	1	3.0		
Algebra II	B-3		5	1	3.0		
Adv. Mathematics							
Totals 8	23	15	46	25	35.2	6	14
Averages	2.9	5.0	5.8	3.1	4.4		2.3

*Anticipated grade

Comments:

The subject found it difficult to remember in much detail many of his high school science courses. Biology and Trigonometry seemed to be the most distinct in his mind. What is most surprising is his Chemistry evaluation. From what he could remember about it, it seemed to be a very good course, yet he seemed more interested in the other two courses. He stated that he had not taken high school too seriously and found college much harder than expected.

DATA SHEET

Subject #10
Date 9 May
Curriculum Nursing

Time (start) 3:20 p.m.
Time (end) 4:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 121	D-1
Physics						Chemistry 122	C-2*
Biology	B-3	5	6	5	5.3	Microbiology	A-4
Adv. Biology						Zoology 112	B-3*
Plane Geometry	C-2		4	2	3.0		
and))))) Solid Geometry							
Trigonometry							
Algebra I	C-2		4	1	2.5		
Algebra II							
Adv. Mathematics							
Totals 3	7.0	5.0	14	8	10.8	4	10
Averages	2.3	5.0	4.7	2.7	3.6		2.5

*Anticipated grade

Comments:

This student recalls little of her science training in high school. Biology seems to be the most distinct. The two Mathematics courses that she took were taught in the old traditional manner. Lots of memorization, repetition, etc. Her Geometry course was ranked 2 only because she recalled building geometric models outside of class.

DATA SHEET

Subject #11
Date 10 May
Curriculum Zoology & Pre-medicine

Time (start) 7:00 p.m.
Time (end) 8:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	A-4	7	7	3	5.7	Math 114	B-3
Physics	B-3	7	7	6	6.7	Math 115	A-4
Biology	B-3	5	5	3	4.3	Math 121	B-3*
Adv. Biology						Chemistry 131	C-2
Plane Geometry	A-4		7	4	5.5	Chemistry 132	B-3
and))))) Solid Geometry						Chemistry 133	B-3*
Trigonometry	A-4		7	2	4.5	Zoology 107	B-3
Algebra I	A-4		7	2	4.5	Zoology 108	A-4
Algebra II	A-4		7	2	4.5		
Adv. Mathematics	A-4		7	6	6.5		
Totals 8	30	19	54	28	42.2	8	25
Averages	3.8	6.3	6.8	3.5	5.3		3.1

*Anticipated grade

Comments:

This was a most eager student. His high school science background seemed to be extremely good and his success in college so far seemed very good. His Geometry was taught by the synthetic approach and the Algebras from the 'modern' or numerical analysis approach. The labs in his Chemistry, Physics, and Biology were not cookbook entirely, but rather were based on research. His advanced math class was described as being very well taught and challenging. He mentioned that there were only six pupils in it. Biology and the Algebras were not too well remembered as they were taken during his freshman and sophomore years. But the rest of the courses were quite well remembered and the discussion brought out considerable detail, so the evaluations in this case seem quite well founded.

DATA SHEET

Subject #12
Date 16 May
Curriculum Nursing

Time (start) 1:15 p.m.
Time (end) 2:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	B-3	8	7	7	7.3	Chemistry 121	B-3
Physics						Chemistry 122	B-3*
Biology	B-3	6	6	2	4.7	Microbiology	A-4
Adv. Biology						Zoology 112	B-3*
Plane Geometry	C-2		4	1	2.5		
Solid Geometry							
Trigonometry							
Algebra I	B-3		4	1	2.5		
Algebra II	B-3		4	1	2.5		
Adv. Mathematics							
Totals 5	14	14	25	12	19.5	4	13
Averages	2.8	7.0	5.0	2.4	3.9		3.2

*Anticipated grade

Comments:

This student said that she found Chemistry one of her most interesting high school science courses. Because of this she said that she was not afraid of college Chemistry like the other girls were. This seemed most interesting, so we talked at some length about her high school Chemistry and why she thought the other girls were afraid of Chemistry. Apparently they were afraid of Chemistry because they failed to appreciate the chemical formulas and the necessity of learning the basic language. Her high school class was able to participate in projects and to learn the reason why equations and formulas were necessary. She had a fair concept of the scientific method even though she did not know it by name.

DATA SHEET

Subject #13
Date 17 May
Curriculum Civil Engineering

Time (start) 9:10 a.m.
Time (end) 9:35 a.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 131	C-2
Physics	B-3	7	6	6	6.3	Chemistry 132	C-2
Biology	B-3	5	5	5	5.0	Chemistry 134	C-2*
Adv. Biology						Math 121	C-2
Plane Geometry	B-3		7	7	7.0	Math 122	C-2
Solid Geometry	A-4		7	7	7.0	Math 123	B-3*
Trigonometry	A-4		6	7	6.5		
Algebra I	B-3		5	2	3.5		
Algebra II	B-3		5	2	3.5		
Adv. Mathematics							
Totals 7	23	12	41	36	38.8	6	13
Averages	3.3	6.0	5.9	5.1	5.5		2.1

*Anticipated grade

Comments:

Not too much to say. We had a very quick interview. He seemed rather nervous and quite vague. Physics and Geometry were his best courses in high school. Same instructor for both. There was plenty of outside work in Physics, aimed primarily at science fair projects. His project was on spectroscopy.

DATA SHEET

Subject #14
Date 17 May
Curriculum Nursing

Time (start) 2:35 p.m.
Time (end) 3:10 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry						Chemistry 121	D-1
Physics						Chemistry 122	C-2*
Biology	A-4	6	6	3	5.0	Zoology 112	B-3*
Adv. Biology	A-4	6	6	6	6.0	Microbiology	B-3
Plane Geometry	C-2		6	4	5.0		
Solid Geometry	C-2		6	4	5.0		
Trigonometry							
Algebra I	B-3		4	1	2.5		
Algebra II							
Adv. Mathematics							
Totals 5	15	12	28	18	23.5	4	9
Averages	3.0	6.0	5.6	3.6	4.7		2.2

*Anticipated grade

Comments:

This student had a very vivid memory of her high school Biology and Advanced Biology courses. The Biology was ranked low in "D" because she said that her class was quite large and there was not much work assigned outside of class. Her Advanced Biology was much better. She expressed a dislike for Mathematics but after talking to her, it was found that her geometries had been taught from the synthetic approach.

DATA SHEET

Subject #15
Date 20 May
Curriculum Physics

Time (start) 2:50 p.m.
Time (end) 3:25 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	A-4	7	8	8	7.7	Math 131	B-3
Physics	A-4	6	7	5	6.0	Math 132	A-4
Biology	C-3	5	5	5	5.0	Math 133	B-3*
Adv. Biology						Chemistry 131	B-3
Plane Geometry	B-3		5	5	5.0	Chemistry 132	B-3
and))))) Solid Geometry						Chemistry 133	A-4*
Trigonometry	A-4		8	7	7.5	Physics 227	A-4*
Algebra I	C-2		5	1	3.0		
Algebra II	B-3		5	1	3.0		
Adv. Mathematics	A-4		8	8	8.0		
Totals 8	27	18	50	40	45.2	7	24
Averages	3.4	6.0	6.2	5.0	5.7		3.4

*Anticipated grade

Comments:

This person is obviously a very bright person. His analyses of high school courses are very interesting, convincing and most likely accurate. The courses that he liked best were those that had considerable research work, individual projects, outside work, etc. The Algebras, Geometries, and Biology he considered 'boring', and said that they were his hardest courses. He was able to describe very clearly and concisely the 'scientific method'.

DATA SHEET

Subject #16
Date 21 May
Curriculum Pre-medicine

Time (start) 3:35 p.m.
Time (end) 4:15 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	B-3	4	5	1	3.3	Chemistry 131	B-3
Physics	B-3	4	4	4	4.0	Chemistry 132	B-3
Biology	A-4	6	8	5	6.3	Chemistry 133	B-3*
Adv. Biology	A-4	8	8	7	7.7	Math 114	A-4
Plane Geometry	B-3		5	1	3.0	Math 115	A-4
and))))) Solid Geometry						Math 121	B-3*
Trigonometry	B-3		4	1	2.5	Zoology 107	B-3
Algebra I	C-2		4	1	2.5	Zoology 108	A-4
Algebra II							
Adv. Mathematics							
Totals 7	22	22	38	20	29.3	8	27
Averages	3.1	5.5	5.4	2.9	4.2		3.4

*Anticipated grade

Comments:

This student viewed his high school background, in general, as being weak. He felt that his best course was Biology and Advanced Biology. The instructor assigned considerable outside work. The class in Advanced Biology was taught on an informal basis with the students being given considerable time for independent study. He said that Chemistry and Mathematics were fairly hard for him in college and that he had to work quite hard to get good grades. Zoology was considered easy due to his Advanced Biology. Also he said that the study habits and research methods that he learned in Biology helped him in his other college courses.

DATA SHEET

Subject #17
Date 22 May
Curriculum Chemistry

Time (start) 3:05 p.m.
Time (end) 4:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	B-3	2	5	3	3.3	Chemistry 131	C-2
Physics	C-2	2	5	1	2.7	Chemistry 132	C-2
Biology	B-3	5	5	5	5.0	Chemistry 133	C-2*
Adv. Biology						Math 121	B-3
Plane Geometry	D-1		4	1	2.5	Math 122	C-2
and))))) Solid Geometry						Math 123	C-2*
Trigonometry	C-2		5	2	3.5	Physics 227	D-1*
Algebra I	B-3		4	1	2.5		
Algebra II	B-3		4	1	2.5		
Adv. Mathematics							
Totals 7	17	9	32	14	22.0	7	14
Averages	2.4	3.0	4.6	2.0	3.1		2.0

*Anticipated grade

Comments:

The subject said that she had enjoyed science and her teachers in high school, but that she found college science quite difficult, and was considering switching curricula. Although she enjoyed her science in high school it became quite apparent upon discussion that her courses were lacking in 'quality'. Upon being asked why she took science, she said that her father was an engineer and wanted her to. He had helped her in high school and she found science interesting through him.

DATA SHEET

Subject #18
Date 23 May
Curriculum Chemical Engineering

Time (start) 2:05 p.m.
Time (end) 2:55 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	B-3	1	5	1	2.3	Chemistry 131	C-2
Physics	B-3	4	6	2	4.0	Chemistry 132	B-3
Biology	C-2	5	5	5	5.0	Chemistry 133	C-2*
Adv. Biology						Math 121	D-1
Plane Geometry	C-2		5	1	3.0	Math 122	B-3
and))))) Solid Geometry						Math 123	B-3*
Trigonometry	B-3		6	6	6.0		
Algebra I	B-3		4	1	2.5		
Algebra II	B-3		4	1	2.5		
Adv. Mathematics							
Totals 7	19	10	35	17	25.3	6	16
Averages	2.7	3.3	5.0	2.4	3.6		2.5

*Anticipated grade

Comments:

Chemistry lab was completely of the cookbook variety and even then there was only one lab every three or four weeks. Trigonometry sounded like a good course due to the outside use of trigonometry in simple surveying problems. The Algebras were only vaguely remembered and what little could be recalled was of the traditional repetition variety.

DATA SHEET

Subject #19
Date 24 May
Curriculum Chemistry and Pre-medicine

Time (start) 9:00 a.m.
Time (end) 9:40 a.m.

High School Course		Grade	Evaluation				College Course		Grade
			B	C	D	Average			
Chemistry		B-3	3	7	2	4.0	Chemistry 131		B-3
Physics		B-3	2	3	1	2.0	Chemistry 132		C-2
Biology		A-4	5	8	6	6.3	Chemistry 133		C-2*
Botany		A-4	8	8	8	8.0			
Adv. Biology		A-4	8	8	8	8.0	Math 121		B-3
Plane Geometry		C-2		4	1	2.5	Math 122		A-4
Solid Geometry		B-3		3	1	2.0	Math 123		A-4*
Trigonometry		A-4		6	5	5.5	Physics 227		B-3*
Algebra I		B-3		3	1	2.0	Zoology 107		A-4
Algebra II		A-4		3	1	2.0	Zoology 108		B-3
Adv. Mathematics		A-4		7	7	7.0			
Totals	11	38	26	60	41	49.3		9	28
Averages		3.5	5.2	5.5	3.7	4.5			3.1

*Anticipated grade

Comments: This subject has had a terrific background in science and seems to be quite scientifically oriented. He says that he has always been interested in science and intends to take as much as possible. The interview proceeded quite well with the subject being most eager to discuss his background. His descriptions of courses seemed well considered and for the most part quite accurate. I was amazed at how well he could recall courses and instructors of two or three years past. His most challenging course was Biology and Advanced Biology. The outside work was of the nature of the Limenological study. In the lab he said there were always three or four projects being conducted.

DATA SHEET

Subject #20
Date 24 May
Curriculum Chemical Engineering

Time (start) 3:00 p.m.
Time (end) 4:00 p.m.

High School Course	Grade	Evaluation				College Course	Grade
		B	C	D	Average		
Chemistry	A-4	8	7	8	7.7	Chemistry 141H	B-3
Physics	A-4	7	8	7	7.3	Chemistry 142H	A-4
Biology	B-3	6	6	6	6.0	Chemistry 143H	B-3*
Adv. Biology						Math 121	B-3
Plane Geometry	A-4		5	4	4.5	Math 122	B-3
and)))))) Solid Geometry						Math 123	A-4*
Trigonometry	A-4		6	6	6.0		
Algebra I	C-2		4	4	4.0		
Algebra II	A-4		4	4	4.0		
Adv. Mathematics	A-4		8	8	8.0		
Totals 8	29	21	48	47	47.5	6	20
Averages	3.6	7.0	6.0	5.9	5.9		3.3

*Anticipated grade

Comments: An exceptional student! He was placed in ability grouped science courses in high school and said that the courses were quite challenging. Most of his high school classes averaged about ten to fifteen students. He said that they were given numerous outside projects. In Chemistry and Physics labs they were allowed to set up their own experiments. This meant that the instructor told them the phenomena that they were to observe and they were to determine how. The student mentioned that only during the last two years of high school did he really feel challenged. His Advanced Math evaluation in this case is quite significant. He said that they were introduced to Calculus and Analytical Geometry by means of the limit approach. Their instructor assigned considerable outside work for a Math class and this student thoroughly enjoyed it.