SCHOLASTIC ACHIEVEMENT OF HIGH SCHOOL VOCATIONAL AGRICULTURE STUDENTS IN COLLEGE ENGINEERING CURRICULUM

by

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CHAPTER I

INTRODUCTION

The intent of the author was that the following perspective be directed to advisors of high school students. The introductory discussion was designed to include a view of American public secondary education, a description of the vocational agriculture program and a limited analysis of the farming situation; and a view of college education, more specifically, college training in engineering at the time of the study. The objective of the study was to gather and to present information which would be helpful to those high school students who considered these alternative patterns of schooling and career.

A PERSPECTIVE DIRECTED TO ADVISORS OF HIGH SCHOOL STUDENTS

A View of American Public Secondary Education

A statement of the principles of secondary education was made by the Commission on the Reorganization of Secondary Education. The statement entitled, Cardinal Principles of Secondary Education, presented the "Seven Cardinal Aims": 1) health, 2) command of the fundamental processes, 3) worthy home membership, 4) vocation,

5) citizenship, 6) worthy use of leisure time, and 7) ethical character. (1, p. 7)

A tabulation in 1956, indicated that there was a record high of 36 million students in the United States, an increase of 5,750,000 since four years earlier. The classification in 1956 was 1,500,000 kindergarten, nearly 25 million in elementary school, 7,700,000 in high school, and 2,400,000 in college, with four million in private and parochial schools. (1, p. 5)

Considered critical in 1958, was the supply of qualified high school teachers and a lack of science and technical background on the part of high school graduation. According to Life (22, p. 94) there was a shortage of 227,000 teachers in the United States. Killian (21, p. 85) also reported that there were 80,000 teachers in the United States with sub-standard or emergency credentials.

Secretary Folsom (5, p. 69) reported in 1957 that one out of three high school graduates in the United States had a year of chemistry; one out of four had a year of physics; and one out of three had more than a year of algebra.

A survey of instruction in high school mathematics financed by the Carnegie Corporation of New York and conducted by the Education Testing Service of Princeton, New Jersey, indicated that 62 per cent of the colleges surveyed reported a necessity to repeat high school mathematics in college. Dr. Boring (6, p. 78) discussed a survey which showed that the college engineering curricula in the United

States were requiring 4.7 year. He assumed that the extra .7 of a year was used to make up high school deficiencies, particularly in mathematics and science.

A View of Vocational Agriculture

Federal Legislation. Many high schools in the United States have offered vocational agriculture as either an elective or required course in the curriculum. This federally supported vocational program has played a vital role in many rural high schools.

The Smith-Hughes Act, passed by Congress in 1917, was the first of the National Vocational Education Acts. The Smith-Hughes Act provided an annual appropriation of $3,000,000 for the purpose of cooperating with the states in paying salaries and transportation costs of agricultural education personnel. Money has been allotted to the states in proportion which their rural population bears to the total rural population in the United States. The program under this act was administered by the United States Office of Education through the respective State Boards of Vocational Education. (32, p. 26)

The controlling purposes of the Act were: 1) That "such education shall be to fit for useful employment, 2) that such education shall be less than college grade, 3) that such education be designed to meet the needs of persons over fourteen years of age who have entered upon, or who are preparing to enter upon, the work of the farm or of the farm home".

The George-Barden Act, was passed in 1946, and replaced the supplements to the original Smith-Hughes Act, the George-Reed Act of 1929, George-Ellzey Act of 1934, and George-Deen Act of 1936. Further development of vocational agriculture in the several states and territories, was the intention of this annual appropriation of an additional $10,500,000. (32, p. 27)

Under support from these Acts in 1954-55, there were 456,964 high school students enrolled in vocational agriculture; 272,363 adult farmers and 46,811 young farmers which had recently graduated.

National Defense War Training Acts. During the period of October 1940 through June 1945, vocational agriculture of the states received further support from the federal government through a series of National Defense War Training Acts. Approximately 4,500,000 out-of-school youths and farmers in 15,000 rural communities were enrolled in 200,000 courses during this war period. (32, p. 28)

Criticism of Federal Support to Vocational Agriculture. Federal support of high school vocational agriculture has not been without criticism. Professor Bestor commented on the Folsum memorandum which read: "All forty-eight states now have special units and programs to promote the teaching of home economics, agriculture and distributive trades. Only eight states had special directors or units last year (1956) to foster and improve the teaching of science and mathematics."

Bestor's reply was:

> This is another evidence of the vocationalism and anti-intellectualism of our present system. And the government is partly responsible. It has been pumping a great deal of money into the school system -- few people seem to realize this -- but much of the federal money has gone into vocational programs like these. . . Under the Smith-Hughes Act and certain other ones, it has made grants for agricultural education, home economics and similar subjects in the schools. In my opinion, this was exactly the wrong direction for federal support to take. There is no reason to believe that the states will not supply enough money for this kind of vocational training. What they seem reluctant to do is furnish enough money for basic education. I think the Federal Government's role ought to be to subsidize instruction in fundamental fields such as science and mathematics. (5, p. 75)

Scope of Vocational Agriculture. Vocational agriculture was introduced into Oregon public schools in 1919, with three schools -- Enterprise, Gresham, and Hood River -- participating with the State Department of Vocational Education that first year. In 1955-56 there was a total enrollment of 3,885 vocational agricultural students in eighty-six secondary schools in Oregon. These eighty-six departments employed ninety-four instructors.

A complementary activity of vocational agriculture, The Future Farmers of America, was initiated as a national organization in 1928 as an outgrowth of various boys' clubs in the local agricultural departments. In 1955 the FFA was the largest organization of its kind in the world with an active membership of 383,219, plus associate and honorary members. (36)[1]

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[1]General reference, wherever page is not shown.

A View of the Farming Business

Role of Vocational Agriculture. An objective of high school vocational agriculture was to provide agriculturally trained graduates to assume the farming position open to beginning farmers. However, for every four persons who entered farming each year, there were only two vocational agriculture graduates from high school and of these two only one entered farming. (20, p. 3)

Classification of Farms. In 1956, 13.3 per cent of the United States population, or twenty-two million, lived on farms. Under Secretary of Agriculture, True D. Morse, (25, p. 2) classified the United States farms in November 1957 as summarized in the following table:

TABLE 1. CLASSIFICATION OF FARMS

Product Sales Per Year	1939	1954	% Change	% 1954 Farm Marketings
Commercial				
Large Scale $5,000+	897,000	1,290,000	44+	79
Medium Scale $2,500 - 4,999	1,015,000	811,000	20-	12
Total		2,101,000		91
Residential				
Part-time*	1,181,000	1,507,000	22+	
Small-scale**	2,847,000	1,174,000	59-	
Total		2,681,000		9

* Operator worked off the farm 100 days or more or family income from off-farm sources exceeded sales from the farm.

** Small scale -- operator worked off farm fewer than 100 days or where family income from off-farm sources did not exceed sales from the farm.

Some Economic Factors in Farming. The farmer's share of the consumer's food dollar has gradually decreased from 49 per cent in the period 1947-49 to 40 per cent in 1956. (34, p. 37) However, the tremendous upsurge of farm technology, and the increasing contribution of non-farm workers to agricultural production, made it possible in 1957 for one farm worker to support nineteen other persons, a doubling of production since 1940. Under Secretary Morse said that total farm production had continued to rise even though twenty-five million acres were taken out of production through the Soil Bank. (34, p. 15)

Government price support and stabilization programs cost $1.9 billion in 1956 and jumped to $3 billion in 1957. In 1951-52, the year following the Korean boom, the value and volume of United States Farm Exports dropped 30 per cent; however, by 1955-56 exports reached a post-war high. In 1955, 2/5 of the United States foreign economic aid was in the form of agricultural commodities. Even greater exports of American food stuffs were expected because of general prosperity abroad, reduced foreign supplies of some commodities, and expanded federal surplus disposal programs. (34, p. 9)

A View of Public Higher Education

Enrollment Trends. In 1900, one out of twenty-five college age youth went to college; in 1930, one out of twelve, and in 1957, one

out of every three went to college. An estimate was made that by 1967 the proportion of college age youth attending college would reach 50 per cent.

In 1900 there were 250,000 students enrolled in college and in 1957 there were 3.2 million. An estimation for college enrollment in 1967 was double that of 1957, and for 1975, triple the 3.2 million in 1957.

Because of the increasing enrollment and limited expansion of facilities, higher entrance standards may be needed to achieve greater selectivety in some colleges in the United States. (14, p. 48)

During the biennium 1955-57, total college enrollment under the Oregon State Board of Higher Education rose from 14,816 to 18,572, an increase of 25 per cent. The teaching staff rose from 959 to 1,124, an 18.9 per cent increase. (36, p. 14)

A 19 per cent increased enrollment during 1957-59 is estimated by the Oregon State Board of Higher Education. The proposed budget for the period 1957-59 represented an increase of 28 per cent over the former operating level; the budget was estimated to be $46,349,549. (36, p. 15)

Need for College Engineering Graduates. Dr. Beckman (3, p. 83) reported that in the United States there were between 400,000 and 750,000 actively employed engineers and scientists. He estimated that the United States needed from 35,000 to 50,000 new engineers each year, and that the colleges graduated only about 22,000 engineers

each of the years 1954 and 1955. He quoted figures which illustrated the fact that since 1950 there was a 50 per cent decrease in technically trained college graduates. The engineering enrollment figures in 1956 showed that in the United States there was one engineering student for every 974,000 of the national population.

According to M. R. Haith, engineering placement officer at Oregon State College, the employment prospects for engineering graduates of Oregon State College in 1958 were fewer than in the immediately preceeding years. Whereas, 176 companies and governmental agencies came to the campus to interview engineering graduates in 1957, only 151 were scheduled to come in 1958, a 15 per cent drop. The engineering graduates in 1957 numbered 225 and the students expected to graduate in 1958 totaled about 300.

It was forecast by Haith that all graduates would have found jobs, but it may not have been the number one preference. Starting salaries of engineers were reported to have been up $10 to $15 a month -- from $460 average in 1957 to $475 in 1958. Civil engineers found the most job choices because of federal highway programs. (16, p. 1)

Engineering School at Oregon State College. The department of engineering at Oregon State College was established in 1908 as one of four professional schools: Agriculture, Commerce, Engineering, and Home Economics. (30, p. 288) The School of Engineering and Industrial Arts was accredited by the Engineers' Council for

Professional Development. Courses leading to B.S., M.S., Ph.D., and professional degrees were offered in six branches: Agriculture, Chemistry, Civil, Electrical, Industrial, and Mechanical Engineering. Bachelor's degrees granted in the school of engineering totaled 1,018 since 1952.

Year	No. of Bachelor's Degrees
1952	198
1953	155
1954	156
1955	137
1956	156
1957	216

Oregon residents being admitted to first year standing at Oregon State College must have completed the following uniform entrance requirements approved by the Oregon State Board of Higher Education:

> Graduation from a standard high school with sixteen units, including three units in English, two units of social science, one unit in health and physical education, one unit in mathematics, and one unit in the natural sciences. Graduates of standard Oregon high schools normally meet these requirements. (30, p. 86)
>
> An entering student took no entrance examination; however, he did take placement tests to provide advisors with information as a basis for determining which courses the student was prepared to take. (30, p. 87)

The direct cost of attending Oregon State College in 1957 was $890 for a year. (30, p. 101) An engineering student, however, may have expected to have greater expenses in some areas, such as "books, supplies", than listed.

TABLE 2. EXPENSES INCURRED BY A STUDENT AT OREGON STATE COLLEGE

Expenses		First Term	First Year
Tuition and Regular Fees:			
Tuition	$10.00		
Lab. & course fee	30.00		
Incidentals	17.00		
Building	8.00	$ 65.00	$195.00
Breakage deposit (returnable)		10.00	10.00
Books, supplies (estimate)		35.00	60.00
Room & Board (average)		203.00	580.00
Incidentals		25.00	75.00
Total for Oregon, Alaska & Hawaii		$328.00	$890.00
Out-of-State Tuition		70.00	210.00

A college graduate entering the engineering profession must have had a comprehensive knowledge of the basic sciences, particularly mathematics, physics, and chemistry. Some of the knowledge required of an engineer may have been obtained in high school. It was recommended (30, p. 288) that a high school student who plans to enter college engineering should have taken a minimum of one and one-half years of algebra and one-half year of geometry.

According to George Gleeson, Dean of Engineering at Oregon State College, students in freshman engineering were expected to exemplify: 1) an awareness of the simple concepts of physical sciences and their relationship, 2) a facility with the modes of communication in engineering circles, 3) an attitude that accepts hard work, and 4) a belief in the ethics, honesty, and morality which is common to any field requiring professional competency. (18, p. 12)

INTRODUCTION TO THE PROBLEM

A procedure used in an evaluation of vocational agriculture has been to follow up the graduates of high school who have had a significant experience in vocational agriculture. One such study conducted by Lefors (33, p. 33) was a comparison of a boy's grades in high school vocational agriculture and the kind of farmer he made.

Of the 337 boys who had taken vocational agriculture in his classes during a fifteen year period, Lefors was able to get complete data on 300. He found that the twenty-three students who made "A" grades in agriculture, in 1950, had an average annual income of $3,978.88. The ninety-seven "B" students made $2,835.27; the one hundred forty-two "C" students had an average income of $2,120.00; the fifty-four "D" students had $1,724.97; and, the five "F" students averaged $1,175.00 income annually.

Other research, part of which is reported in this study, has been conducted on the academic performance of vocational agriculture graduates who had enrolled in college. Most of the studies reviewed were limited to those students in the school of agriculture. Other studies recorded the performance of vocational agriculture graduates in specific college courses.

This study was conducted as a follow-up of vocational agriculture graduates who had enrolled at Oregon State College in the school of engineering. A parallel study by Charles E. Pedersen (31)

on the scholastic performance of vocational agriculture students who enrolled in the school of agriculture was conducted over the same period.

STATEMENT OF THE PROBLEM

Vocational agriculture in the high school curriculum has been evaluated as a college preparatory course. One method used in an evaluation has been to determine the performance of vocational agriculture students in college. Some studies have limited the research to the performance of vocational agriculture students in the school of agriculture; other studies have reported the performance in specific courses. This study; however, reports the overall performance of vocational agriculture students in the school of engineering.

The general problem for this study was: What was the academic performance of vocational agriculture students in freshman engineering? The problem was further defined: 1) What was the grade-point average of the vocational agriculture students? 2) To what extent were vocational agriculture students placed on scholastic probation? 3) What proportion earned honor role grades? 4) What was the difference between credit hours attempted and credit hours accepted? 5) What was the performance exhibited in remedial work?

NEED FOR THE STUDY

This research was initiated upon a recognition of a need for determining the performance of vocational agriculture students in engineering curriculum. At Oregon State College, 3.4 per cent of the average freshmen engineering enrollment have had two or more units of vocational agriculture in high school. According to the study made by Pedersen (31), 42 per cent of the students enrolled in agriculture had taken two or more units of vocational agriculture.

According to an estimation by Dr. Beckman (3, p. 83), there would be a need in the United States of 35,000 to 50,000 new engineers each year; the colleges, on the other hand, were graduating only 22,000. It was assumed that students with a background of vocational agriculture would continue to enroll into the school of engineering.

Therefore, it was believed that there was a need for information which would contribute in making a selection of high school subjects. Records indicate that over one-third of all engineering freshmen at Oregon State College took some remedial mathematics.

PURPOSE OF THE INVESTIGATION

The purpose of this study was to gather and present data which would describe the academic performance of vocational agriculture graduates in the school of engineering at Oregon State College. The study reported:

1) The GPA earned by the vocational agriculture students who enrolled in engineering in the years 1951-52 through 1956-57.

2) The number of students who earned below a two grade-point average, and were therefore placed on scholastic probation.

3) The number of students who earned 3.5 grade-point average or better, being qualified, therefore, to be placed on the honor roll.

4) The difference between credit hours attempted and credit hours accepted.

5) The performance in remedial work.

This study was supplementary to another by Pedersen (31) who described the performance of vocational agriculture students in the school of agriculture at Oregon State College, during the same period.

ASSUMPTIONS UPON WHICH STUDY WAS BASED

For this investigation it was necessary to make several assumptions upon factors which could not be determined accurately by the author. These assumptions were:

1) The "agriculture" indicated on the high school transcript was "vocational agriculture" as herein described.

2) The high school transcript of each student as appeared in the registrar's records included all high school courses for which the student received credit.

3) Students used in this study graduated from high school, having met Oregon State College entrance requirements at the time of enrolling.

4) The home address appearing on the transcript was the place of the high school graduation.

5) That two or more years of vocational agriculture would have contributed a significant experience in the curriculum of the high school student.

LIMITATIONS OF THE STUDY

Limitations of this study were imposed because of the time available for research and for processing the gathered data. Other qualifications of this investigation were common to those of the study by Pedersen. (31)

Only those freshmen in engineering in the years 1951-52 through 1956-57 who had graduated from a high school within the continental United States were selected for this study. Only the performance within the academic year in which he enrolled was recorded. None of the individual students selected had credit transferred from another college institution.

These students described above having had two or more units of vocational agriculture in high school were placed in the vocational agriculture group.

Data was gathered from the files of only the engineering, agriculture, and science schools, therefore vocational agricultural students, who had at one time enrolled into engineering as freshmen and then transferred into schools other than agriculture or science, were not included in this study. For the transcripts followed the students when transfer was made from one school to another within Oregon State College.

Data concerning high school, English, and ACE deciles for freshman engineers fitting the limitations of this study were gathered on those students enrolling into engineering fall term only of the years 1954-55, 1955-56, and 1956-57. These decile scores were derived from the official enrollment record; on the other hand, the mean grade-point averages were obtained on the freshman engineering class as a whole from the summary of academic performance in the office of the registrar, which included freshmen in engineering not within the limitations of this study.

Validity of comparisons between the vocational agriculture group and the all-freshmen was limited because the all-freshmen means included the vocational agriculture students. Furthermore, statistical procedures in presenting the data were limited because of the disproportionate number of vocational agriculture students. The mean in most instances was used to indicate central tendency. No scope of this research did not control variables such as high school background and decile ratings of the all-freshmen group.

RESEARCH PROCEDURES

This study was conducted as a normative survey and all data were gathered from student records made available by the office of the registrar and the Dean of engineering.

An individual 3 x 5 inch card was used to record data on each student. The cards were first mimeographed with a form indicating the blanks to be filled. Included were the student's registration number; high school from which he graduated; date of high school graduation and units of mathematics, science, and vocational agriculture earned in high school. Also recorded was information concerning the date of college registration; ACE, English, and high school deciles, the number of credit hours attempted and the number accepted; grade point averages each term; and the grade received in each remedial course. (See Figure 1) The margins of the cards were coded according to student status at the time of the study and to year of enrollment. (See Figure 2)

Data were recorded on each vocational agriculture student who entered the engineering school during the years 1951-52 through 1956-57 and whose records at the time of the study were in either the active student files of the engineering, agriculture, or science school, or in the inactive or graduate files of the engineering school.

Deciles and recommended mathematics and English placement for the students in the all-freshmen group were obtained by recording

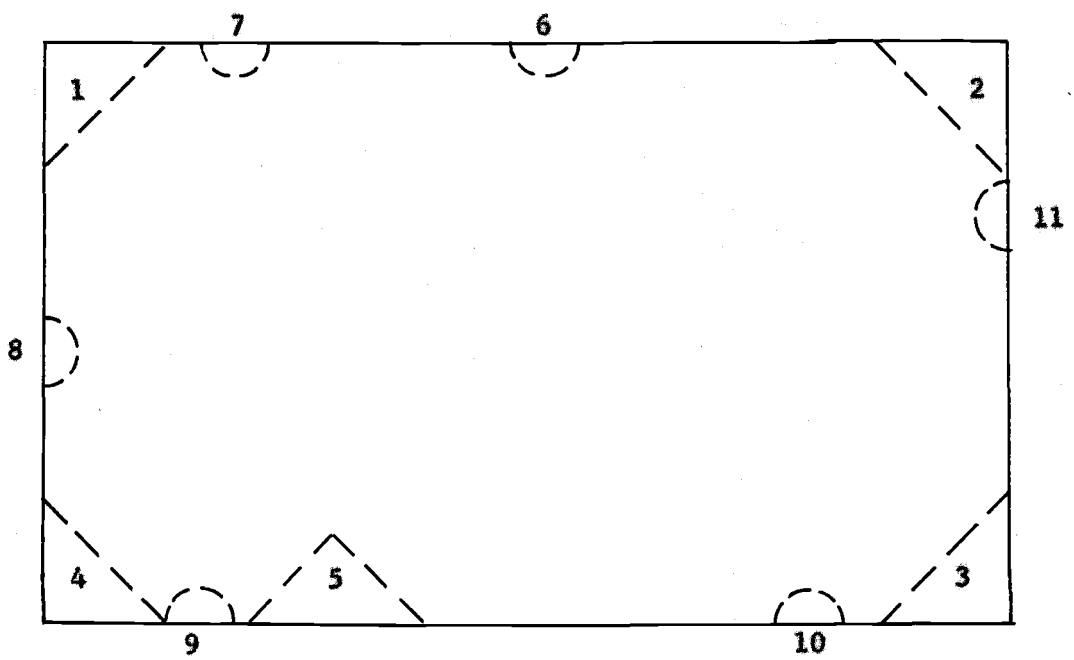
FIGURE 1. DESCRIPTION OF DATA CARD

```
Students Registration Number                OSC Grad  19.....
From.........................               H.S. Grad 19.....
Eng......ACE......HS........                Fr.       19.....

ATT.....ACPT.....GP.....GPA.....F.....W.....S.....

E.Alg.......          Trig.......          Mth 5.......
I.Alg.......          Chem.......            10.......
P.Geo.......          G.Sc.......           100.......
S.Geo.......          Phys.......
                                           Wr.10.......
AG..........
```

FIGURE 2. CODE ON DATA CARD



Explanation of Figure 2.

A. Status of student at time of study.

1. Active student in engineering.
2. Inactive student in engineering.
3. Graduate of engineering.
4. Active student in science.
5. Active student in agriculture.

B. Year of enrollment.

6. 1951-52.
7. 1952-53.
8. 1953-54.
9. 1954-55.
10. 1955-56.
11. 1956-57.

three year's data, 1954-55, 1955-56, and 1956-57 on tally sheets. Grade-point averages for the freshman engineering classes were obtained from the official academic summary in the office of the registrar.

DEFINITION OF TERMS

Several terms defined below, appeared in this study.

Standard high school. According to the Oregon State Board of Education, nineteen units were required for graduation from a standard high school. The required courses were:

3 units of English

2 units of Social Studies

2 units of Health Instruction and Physical Education

1 unit of Science

1 unit of Mathematics

The remaining units which made up the high school curriculum were established by local policy. (29, p. 15)

High school unit. A measurement of the amount of material in one subject field successfully completed in high school during one academic year. English, for example, offered for one year earned one unit.

Vocational agriculture program.

> Vocational education in agriculture is a nation-wide, federally aided program of systematic instruction in agriculture and farm mechanics for less than college grade, conducted in public schools or classes for those persons over fourteen years of age; who have entered upon or who are preparing to enter upon the work of the farm or of the farm home. (12, p. 4)

Future Farmers of America.

> The Future Farmers of America is the national organization of, by, and for farm boys studying vocational agriculture in public secondary schools which operate under the provisions of the National Vocational Education Acts. It is an educational, non-profit, non-political farm youth organization of voluntary membership, designated to develop agricultural leadership, character, thrift, scholarship, cooperation, citizenship, and patriotism. Its members learn through participating experiences how to conduct and take part in public meetings, to speak in public, to buy and sell cooperately, and to assume civic responsibility. The FFA is an

> intra-curricular part of vocational education in agriculture in the public school system of America. It constitutes one of the most effective devices for teaching through participating experiences. (12, p. 10)

Vocational agriculture students or Vo-ag students. A college freshman who had completed two or more units of vocational agriculture in high school.

All-freshman group. Those students who fit the limitations of this study, those with and those without vocational agriculture in high school who enrolled in engineering fall term 1954, 1955, or 1956. The only exception to this reference was the mean GPA for the freshmen engineering class as a whole which was derived from the summary of academic performances in the records of the registrar.

Active student. Those students enrolled in the school of engineering, agriculture, or science at Oregon State College at the time of this study, winter term, 1958.

Inactive student. Those students whose records in the office of the Dean of engineering were placed in a file of former students who transferred to another institution or who did not return to Oregon State to finish college.

Placement tests.

1) The ACE test, American Council on Education Psychological Examination for College Freshmen, gave an indication of ability to do college work. (30, p. 87) Three of the scores were from: 1) "Q" test (quantitative); measured basic arithmetic functions, 2) "L" test

(Linguistic); included vocabulary and reading, and 3) "T" test (Total), the "Q" and "L" together. The ACE decile referred to the "T" score mentioned above.

2) The English test covered the fundamental principles of grammer, and it tested the students ability to apply these principles in writing.

3) The Mathematics test covered the fundamentals of general mathematics and algebra. Results of the examination normally took precedence in course placement over units earned in high school. (30, p. 88)

Decile rating. A placing into tenths of the run of the frequency curve by performance; 10 decile meaning that performance was in the top 10 per cent of the curve and one being in the lowest 10 per cent of the distribution. The three deciles used in this paper were ACE, English, and mathematics, derived from scores on the respective tests.

Remedial courses. The content of each of the following courses must have been mastered before taking courses in the standard engineering curriculum:

Math 5 - review of elementary school arithmetic

Math 10 - beginning high school algebra

Math 100 - intermediate high school algebra

Writing 10 - review of English composition

From 1951-52 through 1953-54, Math 5 was offered for one hour of credit which did apply toward graduation. However, in 1954, still

"a review of arithmetic", Math 5 was made a three hour course but did not count toward graduation.

The same pattern was true for Writing 10. It was formerly called English K from 1951 through 1953, and was offered as a one credit course. Since 1954 it was identified as Writing 10 and was offered for three credit hours, but it, likewise, did not then apply toward graduation.

During the period covered in this study, Math 10 and Math 100 were offered as four credit courses that did apply toward graduation.

Term hour. The unit of credit, representing three hours of the student's time each week of one term. This may have been assigned to work in classroom or laboratory or to outside preparation.

Grade point. Grade points were assigned on the basis of four being given for each term hour of A grade; three points for each term hour of B; two for C; one for D; none for F.

GPA. The quotient of total grade points divided by the total term hours in which a letter grade of A, B, C, D, or F were received.

Probation. Academic status of a student who had earned a grade-point average below a 2.00, either for a term or cumulative.

Honor roll. Receiving a GPA of 3.5 or higher with twelve or more term hours accepted.

Suspension. Because of unsatisfactory progress toward graduation, as defined by policies of the academic deficiencies committee, a student is not allowed to remain in college.

SOURCES OF DATA

Data on all students selected for this study were collected from files of student records on campus. From the office of the registrar, the official registration record supplied data concerning deciles, and recommended English and mathematics placement for each entering student.

Of the ninety students on whom data were collected, forty-one were enrolled in engineering at the time of this study. Records of twenty-eight were found in the file of inactive students.

In the file of engineering graduates, data on eight students was collected. Seven were recorded from the school of agriculture active student file, and six from the school of science.

A REVIEW OF SELECTED RELATED STUDIES

Several studies were cited regarding the performance of vocational agriculture students in schools of agriculture at college. However, few studies dealt directly with the performance of vocational agriculture students in college level work in fields other than agriculture.

Bunten in a review of the literature (7) declared that researchers dealing with college achievement have advanced many different conclusions. This confusion may have been expected since most of the early investigators made no attempt to use control by stratification, multiple regression, or analysis of co-variance.

Watson (35, p. 58) stated that in his research there was a positive relationship between grades made in high school and grades made in college agriculture. There was a positive relationship between vocational and non-vocational students that indicated the vocational students slightly superior in agriculture in college. A positive relationship between mathematics in high school and agriculture in college was shown. It might be concluded that grades made in mathematics in high school are better predictors of success in agriculture in college than are grades made in agriculture in high school; however, this did not appear to be credited to mathematics as a course, but rather that mathematics was apparently more nearly an indicator of ability than was agriculture.

Bunten (7) reported no difference in the academic achievement of first-quarter college students in agriculture who had a high school vocational agriculture background compared with those who had no vocational agriculture in high school. Findings of this study revealed that students who had taken more than one year of vocational agriculture in high school achieved equally as well as non-vocational agriculture students when achievement was defined in terms of first-quarter grade-point averages in the Division of Agriculture at Colorado Agricultural and Mechanical College.

Luster (23, p. 73) pointed out that former students of vocational agriculture made slightly lower scores on the Ohio State Psychological Examination than did other freshmen. They also made lower scores on the English placement test but scored higher on the mathematics

entrance test. During their first two quarters in college the former students of vocational agriculture made slightly higher overall grades than did students without such experience. They received higher grades in agricultural subjects and mathematics but generally made lower grades in English and chemistry.

Bell (4, p. 35) reported on a follow-up of 417 students who had completed two years of work in agriculture. Students who had a background of high school vocational agriculture had done consistently better work in those subjects in college which were directly related to agriculture than did those students who had no background of high school vocational agriculture. The group with a background of vocational agriculture in high school seemed to have been better adjusted to college work than the group without a background of vocational agriculture in high school as there was nine per cent fewer dropouts from the former group; however, both groups of dropouts were much lower academically than the entire group.

A study made by Pedersen (31), at Oregon State College, indicated that forty-two per cent of six freshmen agriculture classes were former students of vocational agriculture in high school. The mean grade point average for the students with no vocational agriculture or with less than two units was 2.32, whereas the vocational agriculture group earned a mean of 2.407.

O'Brien, (26, p. 52), in 1949, reported a study of achievement in a farm mechanics course of students having had a farm background but also having had various high school curriculums. Data as to the

units of high school industrial arts were obtained in addition to other information. Using analysis of co-variance with multiple classification, O'Brien found that students who had taken high school vocational agriculture did significantly better than students with a high school industrial arts curriculum or students having had curriculums other than vocational agriculture or industrial arts.

In research conducted by Carter (8) the scores on American Council of Education Psychological Examinations and first-quarter English marks were available to be used as controls on scholastic ability and scholastic aptitude. When allowances were made for these controls, Carter found that farm youths having had vocational agriculture exceeded other students by one-third of a letter mark.

Watson, (35, p. 46) compared the vocational and non-vocational students' success in college mathematics and science. Students who did not take agriculture in high school did no better in mathematics and science in college. In fact, students having had four years of vocational agriculture were slightly superior in both mathematics and science in college than those having had no vocational agriculture in high school.

Magill (24), upon summarizing 40 studies made on college performance of vocational agriculture and non-vocational agriculture students, concluded that vocational agriculture courses will serve equally as well as regular college-preparatory courses. Vocational agriculture subjects serve better in rural or town high schools than

the regular subjects. He also stated that four units of vocational agriculture could be granted without handicap to the graduates' entrance into college.

Hester (19), in his study of the performance of former students of vocational agriculture in college found that they excelled in all subjects in college except engineering drawing. The average grades of the vocational group were compared with the average grades of the non-vocational group in the College of Agriculture, the College of Arts and Science, and the College of Engineering. The total points made by each group were found for each of the following courses: English, chemistry, botany, animal husbandry, and agricultural engineering for the College of Agriculture group; English, mathematics, foreign language, history, and biology for the College of Arts and Science group; English, chemistry, mathematics and engineering drawing for the College of Engineering group. It was found that the vocational students made an average of 2.92 as compared with 2.10 for the non-vocational group in the College of Agriculture. In the College of Arts and Science the vocational student averaged 2.36 as compared with 2.26 for the non-vocational group. In the College of Engineering the average grades were 2.89 for the vocational agriculture group as compared with 2.84 for the non-vocational group.

Bailey (2), reported a study in which three variables, the units of high school mathematics, the Q-score on the ACE examination, and L-score on the ACE examination, were used to obtain a forecasting formula from which the probability of graduation from engineering

could have been made for students before entering college. However, at the end of the first semester, a more sensitive forecast could have been made by combining to the above mentioned variables the grade-point average of the first semester. For all practical purposes the probability of graduation from engineering by freshmen students was forecast just as effectively from the first semester averages alone.

Clausen (11) concluded that within the limits of the design of his investigation, the experimental factor, solid geometry, effected superior learning outcomes in Engineering Drawing 4. Clausen's recommendations supported the opinions of writers who have emphasized the need for a more thorough background in high school mathematics for students matriculating in colleges of engineering. The results of this investigation supported these opinions since the findings indicated the beneficial effects of solid geometry on Engineering Drawing 4. It was deemed advisable that high school guidance counselors exert a concerted effort to inform their students of the importance of solid geometry in the engineering curriculum. This would have necessitated a comprehensive guidance program in which prospective engineering candidates would be singled out early in their high school careers to take advantage of high school mathematics offerings.

A study was made of the scholastic success of the class of 1956 which entered Oregon State College in the fall of 1952, from Oregon high schools. (28) It was found that the high school GPA

is the most useful single factor in predicting the success of an incoming student, although reference to other factors used either individually or in combination were useful to some degree. No factor or combination of factors, however, gave a perfect prediction. Ten per cent of those who graduated in four years had a course in remedial English while over 30 per cent of this group had at least one course in remedial mathematics. A higher percentage of those not graduating in four years took remedial courses than did those who graduated in four years. This implied that if a student was deficient in these subjects when he entered college, his chance of graduating in four years was not so great as it would be if he had been prepared for college-level English and mathematics courses. Among those who did not graduate in four years, 26.3 per cent transferred to other institutions; 21.3 per cent were still in Oregon State College after June 1956; and 52.4 per cent dropped out of college altogether. Of those who dropped out, 51.9 per cent had a GPA of 2.00 or better.

From the conclusions reached by other investigators, Douglas (15) concluded that a great many very good students have been barred from college through unjustifiable entrance requirements. Consequently, he recommended that students be admitted to college on the basis of aptitude rather than upon a particular type of college preparatory course of study.

He supported his recommendation by concluding that there was no significant correlation between the number of units of credit earned in high school in any subject matter field and scholastic success in

college. The scholastic success of those students whose patterns of high school credits were deficient in amount in any one of the various fields was to no significant degree inferior to that of the students having presented the prescribed credits.

Garrett (17, p. 138) made a review and interpretation of research related to scholastic success in colleges of arts and science and teachers colleges and concluded that:

> The data revealed that many colleges are basing their entrance requirements on factors which do not have adequate value in predicting success in college, and therefore deny entrance to many students who should be admitted. The absence of any significant correlation between amount and pattern of high school subjects and college scholarship persists in spite of the broadening of high school curricula to include vocational subjects and the reluctance of colleges to vary in a corresponding degree from the original scholastic curriculum heavily loaded with verbal learning. (17, p. 138)

It was further concluded by Garrett that grades in non-academic subjects apparently had as much predictive value as those in the academic subjects. The particular literature that Garrett reviewed seemed to indicate that there was very little relationship among salaries of teachers in high school, occupations of parents, preparations of students for college, and success of students in college.

Aikin writes of the Eight Year Study:

> The results of this study seem to indicate that the pattern of preparatory school programs which concentrate on preparation for a fixed set of entrance examinations is not the only satisfactory means of fitting a boy or girl for making the most out of the college experience. It looks as if the stimulus and initiative which the less

> conventional approach to secondary school education affords sends on to the college better human material than we have obtained in the past. (1, p. 142)

Chamberlin (9, p. 280) believed that when the secondary school program was adapted to the needs of students and gave ample opportunity for developing their various potentials, the probability of their succeeding in college was enhanced.

A generalization, made by Wills (36), was that high school administrators felt that the primary objective of vocational agriculture program should be toward the establishment in farming. However, instruction should not be limited to that objective for all students but rather should include training also in related occupations.

Clark (10, p. 227) recommended the following curriculum to include vocational agriculture: for all students he suggested four years of English, four years of agriculture, and one unit each of mathematics, general science and United States history; for those students who could carry more successfully, he advised Algebra I and II, plane geometry, chemistry and physics; for others, either business or consumer mathematics, bookkeeping or industrial arts.

CHAPTER II

DESCRIPTION OF ENGINEERING FRESHMEN

Background Common to Both Vocational Agriculture and All-Freshmen Groups.

High School Background. Several features were common to the background of both the vocational agriculture students and the all-freshmen group. All students graduated from high schools within the continental United States, and had met the minimum requirements for admission into college as defined by the Oregon State Board of Higher Education.

The uniform college entrance requirements for freshmen were: graduation from a standard high school with sixteen units, including three units in English, two units in the social sciences, one unit in health and physical education, one unit in mathematics, and one unit in the natural sciences. Out-of-state students entering as freshmen were required to have completed the same distribution of subject-matter units as described above. (30, p. 86)

This study recorded the first-year college performance of students in engineering. Therefore data only on those students who entered Oregon State College with no credits transferred from another institution of higher learning were recorded.

Students on whom data were gathered had enrolled in Oregon State College engineering school during the academic years 1951-52

through 1956-57. Also, by nature of the curriculum, few women were found to have enrolled in engineering, an average of two each year. All subjects of this research, however, were male students.

College Curriculum Background. The curriculum into which freshmen engineers enrolled in 1951-52 through 1954-55 was prescribed by the various departments in the engineering school. In 1955-56 a general engineering curriculum was established for all freshmen engineers.

The academic load of the standard engineering curriculum for freshmen totaled from seventeen to nineteen credit hours per term, depending on which military program was chosen. The three-term sequence of Engineering Concepts, GE 101, 102, 103, was offered for three credit hours per term and met for seven hours of class each week. Engineering Concepts was described as "lecture and elementary problems dealing with basic concepts common to all fields of engineering; engineering analysis and methods of work".

Engineering Graphics, GE 111, 112, 113, for two credit hours per term and six hours of class each week, was listed as "fundamental principles and rules of composition of the graphic language of engineering". College Algebra, Math 101; trigonometry, Math 102; and analytic geometry, Math 103, each taken as a four hour course, were offered in the common freshman year.

General Chemistry, Ch 201, 202, 203, was a three-term coverage of the fundamentals of chemistry that were particulary adapted for students in engineering.

Other courses in the common freshmen year were among the college requirements and therefore were standard for all curriculums leading to any bachelor's degree.

VOCATIONAL AGRICULTURE GROUP IN ENGINEERING

Number of Vocational Agriculture Students Enrolled.

Data was collected on ninety of the vocational agriculture students who enrolled in engineering at Oregon State College. Because of the limitations imposed upon the research procedure, the vocational agriculture students who enrolled in engineering but transferred before the end of the academic year to schools other than agriculture or science were not included in the tabulation.

TABLE 3. VOCATIONAL AGRICULTURE STUDENTS ENROLLED IN ENGINEERING

Year	1951	1952	1953	1954	1955	1956	Total
Number	6	6	12	20	26	20	90
% Of Freshmen Engineers	2.5	2.0	2.6	4.3	4.0	3.5	3.4

The number of vocational agriculture students equaled 3.4 per cent of the average freshmen enrollment in engineering. Vocational agriculture students made up 3.2 per cent of the total fall term freshmen enrollment in the school of engineering. The proportion of vocational agriculture students; however, increased with each succeeding term's enrollment; 3.4 per cent of the winter term enrollment and 3.6 per cent of the spring term enrollment.

All but two of the ninety vocational agriculture students enrolled fall term; in 1955 two students enrolled winter term. Of the eighty-eight students who enrolled during the fall terms, five withdrew from college during fall term and two during winter term. Eleven dropped engineering after fall term, and ten dropped after winter term. Of the ninety who enrolled into engineering, 7.7 per cent withdrew during one of the terms and 23.3 per cent dropped out after completing only one or two terms.

Background in Vocational Agriculture.

Although the high school background of the all-freshmen group was not described because of limitations of this paper, the experience in vocational agriculture was outlined for the ninety students who had taken vocational agriculture in high school. All students had taken two or more years of the vocational agriculture program as generally described herein.

Guiding Principles of Vocational Agriculture. Guiding principles of vocational agriculture were that:

> Vocational agriculture consists of instructional activities and supervised farming programs which prepare pupils for agricultural occupations. Emphasis is placed on the development of specific knowledges and skills necessary for successful participation in an agricultural occupation and on the development of understandings, attitudes, and ideals necessary for successful participation in rural life.
>
> The program in agriculture is based upon careful analysis of the particular agricultural needs of the pupils and community. The program is a cooperative enterprise utilizing both the facilities

> of the secondary school and the resources of the community. A desirable balance is maintained between the instructional activities of the classroom and farm-mechanics shop and the practical experiences provided on the farm and in the non-farming agricultural activities of the community. (13, p. 65)

Major Phases of the Curriculum. The major phases of the curriculum included a wide variety of teaching-learning situations. These were: 1) classroom instruction for the nine-month school year, 2) supervised farming program, of at least six months a year, including productive projects, home and farm improvement projects, and supplementary farm practices, 3) farm mechanics, including farm shop skills, farm power and machinery, farm structures, rural electrification, soil and water management and, 4) Future Farmers of America. (32, p. 17)

A sample curriculum may have included the following subjects:

Ag. I (Freshman) - Animal husbandry, dairy and poultry, farm records and farm shop.

Ag. II (Sophomore) - Soils, farm crops, vegetable and fruit production, farm records and farm shop.

Ag. III (Junior) - Farm mechanics, farm accounting and farm problems.

Ag. IV (Senior) - Farm management, rural law and problems, farm forestry and farm shop. (29, p. 200)

Number of Units of Vocational Agriculture. The units of vocational agriculture which the students selected to represent the

vocational agriculture group had to their high school credit were the low of two and as high as eight units.

No. of Ag. Units	No. of Students	% Vo. Ag. Group
2	18	20
3	14	15.5
4	32	35.5
5	12	13.3
6	10	11.1
7	2	3.3
8	2	3.3

In some schools it was the policy to have a double period of vocational agriculture during one or more of the four years. This policy may account for the proportion of students earning more than four units of agriculture. However, the average number of agriculture units earned by the ninety students was 3.9.

Background in Mathematics.

According to the Oregon State Board of Education, successful completion of nineteen units were required to graduate from high school. It was stated that at least one of those units be in mathematics. Table 4 indicates that the vocational agriculture students took an average of 2.5 units of mathematics per student in high school.

Mathematics included all courses in high school general mathematics, elementary algebra, intermediate algebra, advanced algebra, trigonometry, plane and solid geometry.

TABLE 4. MATHEMATICS UNITS

Ag. Units	2	3	4	5	6	7	8	Mean
No. of Students	18	14	32	12	10	2	2	
Av. Math Units Per Student	2.5	2.9	2.3	2.8	2.5	4	2.5	2.5

It may be surmised from Table 4 that there was no appreciable trend in the number of mathematic courses completed by students having taken different numbers of agriculture units.

Background in Physical Sciences.

The Oregon State Board of Education also required that a high school student have completed one unit in the natural sciences to be eligible for graduation.

TABLE 5. SCIENCE UNITS

Ag. Units	2	3	4	5	6	7	8	Mean
Science Units Per Student	1.8	2.9	1.6	1.4	1.1	1	1	1.6

Science courses tabulated above include general science, chemistry and physics.

Background in Mathematics and Sciences Together.

No marked trend was apparent in the number of science and mathematics units completed by students with varying units of agriculture.

TABLE 6. MATHEMATICS AND SCIENCE UNITS

Ag. Units	2	3	4	5	6	7	8	Mean
Math. And Science Units	4.3	4.7	3.9	4.3	3.5	5	3.5	4.1

It may be concluded that in most instances the vocational agriculture students completed the high school graduation requirements with some margin of electives in the mathematics and science fields.

Performance in High School.

The measurement of high school performance available in the study was the high school decile. The mean decile for the vocational agriculture students was 7.53.

TABLE 7. HIGH SCHOOL DECILE RATING

Ag. Units	2	3	4	5	6	7	8	Mean
No. Students	18	14	32	12	10	2	2	--
Mean HS Decile	6.94	7.78	7.53	7.33	8	9.5	8	7.53

There appeared no definite trend in decile ratings among the students having taken different amounts of vocational agriculture. That the performance in vocational agriculture influenced the decile ratings can not be affirmed by the data gathered in this research.

Year of High School Graduation.

Vocational agriculture students who enrolled as freshmen in engineering during the years 1951-52 through 1956-57 had graduated within a twelve year period.

Year of High School Graduation	Number Graduated	% Vocational Ag. Group
1944	1	1.1
1947	4	4.4
1948	1	1.1
1949	7	7.7
1950	6	6.6
1951	6	6.6
1952	6	6.6
1953	12	13.3
1954	13	14.4
1955	18	20.0
1956	16	17.7

There were twenty students who did not enroll in college within the same year of high school graduation. Two students delayed one year before enrolling in Oregon State College; one delayed for three years; five delayed for four years; seven delayed for five years; two delayed for six years; two delayed for seven years; and one delayed for eight years. The seventy other vocational agriculture students, however, enrolled in Oregon State College within the same year of high school graduation.

Although 87.6 per cent of the vocational agriculture students graduated from high schools within the state of Oregon, seven other states were represented in the group.

In-State		79	87.7 Per Cent
Out-Of-State			
Arkansas	1		
California	4		
Indiana	1		
Massachusetts	1		
Minnesota	2		
Nebraska	1		
Washington	1		
	11	11	12.2 Per Cent
Total		90	

College Placement in Mathematics.

An indication of an ability in mathematics was derived from the entering student's performance on the mathematic placement examination. It was the score on this test, from which the decile rating was established, that determined what level of mathematics taken, more than the units of mathematics completed in high school. Although the vocational agriculture group took an average of 2.5 units of mathematics in high school, over 67 per cent were placed in some level of remedial mathematics in college.

TABLE 8. MATHEMATICS PLACEMENT

Level of Math.	5	10	100	Sub. Total	No Remedial Math.	Total
No. of Vo.-Ag. Students	5	27	29	61	29	90
% Vo-Ag. Group	5.5	30	32	67.7	32	100

In Math. 5, a review of arithmetic, 5.5 per cent of the vocational agriculture group was enrolled. Thirty per cent of the vocational agriculture group was registered in Math. 10, elementary algebra, and 32 per cent took Math. 100, intermediate algebra. It was assumed that those students who took no remedial mathematics started with Math. 101, college algebra.

There was a marked difference of mathematics in the high school background of those students who enrolled for varying levels of remedial mathematics. Those needing to take Math. 5 had only 1.6 units of mathematics in high school; whereas, those enrolling in Math. 10 had an average of 2.2 units and students registered for Math. 100 had an average of 2.86 units of high school mathematics per student. The 32 per cent who did not take remedial mathematics in college had taken 2.83 units of mathematics in high school.

There was no significant correlation between the number of units of agriculture and mathematics taken in high school.

There was a greater correlation, however, between units of high school mathematics and mathematic placement in college. As might be predicted, there was no significant relationship between numbers of agriculture units and whether remedial mathematics was required.

TABLE 9. REMEDIAL MATHEMATICS: AGRICULTURE UNITS

No. of Ag. Units	2	3	4	5	6	7	8
No. of Students	18	14	32	12	10	2	2
Having Taken Remedial Math.	66	71	59	75	80	100	100

College Placement in English.

The ninety vocational agriculture students had an average of 6.15 decile rating in the English placement examination. There were 17 or 18.8 per cent who were placed in corrective English.

Academic Load Per Term.

The standard freshman engineering curriculum in 1957, required taking from seventeen to nineteen hours each term. However, only eighteen, or 21.7 per cent, of the vocational agriculture students who completed one or more terms took an average of seventeen hours per term. The mean number of credit hours attempted was 47.1 per year or 15.7 credit hours per term.

ALL-FRESHMEN GROUP IN ENGINEERING

Number of Students Enrolled.

The freshmen class in the engineering school at Oregon State College demonstrated nearly a 300 per cent increase during the years covered in this study.

The fall term enrollment increased each year on an average of nearly 20 per cent of the previous fall registration, the fall 1956 enrollment being 26.8 per cent that of fall, 1950.

There was an average decrease of 33 per cent of the fall term enrollment from fall term to spring term. The decrease on the other hand, of just the vocational agriculture group was 30 per cent.

TABLE 10. FRESHMEN ENROLLMENT IN ENGINEERING

Year	Fall	No. Increase From Prev. Year	% Increase From Prev. Year	Winter	Spring	% Decrease In Three Terms
1951-52	231			164	123	47
1952-53	297	66	28.6	245	211	29
1953-54	378	81	27.3	314	294	22
1954-55	457	79	20.9	402	334	27
1955-56	599	142	31.1	506	401	33
1956-57	619	20	3.3	491	380	39
Total	2581			2122	1743	
Mean			20.0			33

Performance in High School.

The high school decile rating was the single measure of previous performance of the all-freshmen group. For this study the mean high school decile was obtained on the students enrolling in engineering fall term in the three latest years, 1954, 1955, and 1956.

College Placement in Mathematics.

Recommended mathematic placement was secured from the all-freshmen performance on the mathematics ACE test. Data on the three latest years were recorded.

An average of 6.7 per cent of the all-freshmen group was recommended to take Math. 10, whereas 31.3 per cent were advised to take

Math. 100. Of the 1176 freshmen studied in the all-freshmen group, 447 were advised to take some level of remedial mathematics and 62 per cent were found to be prepared to take mathematics in the standard engineering curriculum.

TABLE 11. MATHEMATICS PLACEMENT

Year	Number	Math. 10		Math. 100		Total Rem.		No Rem. Mth.	
		No.	%	No.	%	No.	%	No.	%
1954	355	11	2.6	135	32.8	146	35.5	265	64.5
1955	410	47	11.5	134	32.7	181	44.0	229	55.8
1956	411	21	5.9	99	27.8	120	34.0	235	66.2
Mean	1176	79	6.7	268	33.3	447	38.8	729	62.

College Placement in English.

From 1951 through 1954 the review course in English Composition called "Writing K", was offered for one credit hour and did apply toward graduation. However, in 1955 and 1956 the term "English 10" was applied. The course was then offered for three hours but did not apply toward graduation, the grade earned being figured into only the term average and not the cumulative.

In 1954, and earlier, a student performing exceptionally well on the English placement examination could be declared exempt from taking the first term of English. In 1955, the student performing accordingly was placed in an "honors" section of English 111.

Data concerning the recommended English placement was recorded for the 1176 students who enrolled in engineering the three latest years of this study. It was recommended from the performances on the English placement examination that 140, or 11.9 per cent of the new students take a review of English. On the other hand there were 96, or 8.2 per cent, who were either exempt from taking English 111, as was the case prior to 1955, or were placed in the honors section of English 111, which was offered in 1955 and 1956. The other students were placed in English 111, the first course of a three-term sequence in English Composition.

SUMMARY OF DESCRIPTION OF VOCATIONAL AGRICULTURE AND ALL-FRESHMEN GROUP

Several factors were common about all students used in the analysis of this investigation. Each student had graduated from a high school within the continental United States and had met the minimum entrance requirements to enroll at Oregon State College. None of the students, however, had earned college credit from another institution that applied toward graduation from Oregon State College. All students enrolled within a six year period, from 1951-52 through 1956-57, and were all male students.

There was the total fall term enrollment of 2581 freshmen engineering students over the six years. In the fall term of the three latest years of the study, 1954, 1955, and 1956, there were 1675 freshmen enrolled in engineering; however, only 1176 of these fit

the limitations of this study described above and were therefore placed in what was termed the all-freshman group. There were ninety vocational agriculture students in the all-freshman group. The ninety vocational agriculture students made up 3.5 per cent of the total freshmen engineering classes over the six years.

There was a 33 per cent decrease in the freshmen classes from fall term to spring term and a 30 per cent decrease in the enrollment of vocational agriculture students.

The high school decile, the only measure of previous performance, of the vocational agriculture group was 7.53; whereas, the decile of the all-freshman group in the three latest years was 7.72.

Averaging the performance on all tests in the ACE examination gave a total score from which the ACE decile was determined. The mean ACE decile for the vocational agriculture group was 6.70; for the all-freshman group it was 6.97.

College placement in English for the vocational agriculture group showed 18.8 per cent having taken corrective English; whereas 11.9 per cent of the all-freshmen group were placed in review English. However, the average English decile for the vocational agriculture group was 6.15 and the all-freshman was 6.02.

Data pertaining to mathematics placement indicated that 68 per cent of the vocational agriculture group took some level of remedial mathematics. Thirty-nine per cent of the all-freshmen group was recommended to take remedial math.

CHAPTER III

PERFORMANCE OF FRESHMEN IN ENGINEERING

Performance of Vocational Agriculture Group.

The purpose of Chapter III was to report the performance of the vocational agriculture group and the all-freshmen group. Data on the vocational agriculture group was reported pertaining to: 1) cumulative grade-point average, 2) extent of students being placed on probation, 3) proportion on the honor roll, 4) credit hours attempted and credit hours accepted, and 5) performance in remedial work. These five points applied to the vocational agriculture group were the measures of academic performance used in this study. Data was not available in this research to make an identical analysis on the all-freshmen group.

Grade-Point Average. The cumulative grade-point average was 2.57 for the vocational agriculture group, as tabulated below.

Year	GPA
1951-52	2.36
1952-53	2.52
1953-54	2.37
1954-55	2.65
1955-56	2.58
1956-57	2.48
Mean	2.57

The GPA for each year was computed by dividing total credit hours attempted into total grade points earned and the mean GPA was calculated in a like procedure. The GPA ranged from a low of 2.36 in 1951-52 to a high of 2.65 in 1954-55.

The following tabulation indicated the distribution of vocational agriculture students earning various grade-point averages for the work completed in the engineering school the first year.

GPA	NO.	
3.75 - 4.00	1	
3.50 - 3.74	3	
3.25 - 3.49	3	
3.00 - 3.24	4	
2.75 - 2.99	9	
2.50 - 2.74	20	Mean - 2.57
2.25 - 2.49	12	
2.00 - 2.24	12	
1.75 - 1.99	9	
1.50 - 1.74	3	
1.25 - 1.49	4	
1.00 - 1.24	4	

As indicated, the mode GPA of 2.50 to 2.74 included the mean performance, 2.57.

Incidences of Probation. An average of nearly 20 per cent of the vocational agriculture students received a term grade-point average of below 2.00 and were therefore placed on academic probation.

Of the eighty-three vocational agriculture students who completed fall term, sixteen or 19.3 per cent received a GPA of below 2.00. Over nineteen per cent of those who finished winter term were

placed on probation, and 21 per cent of those who completed spring term, for an average of 19.8 per cent having been on probation.

Twenty out of the ninety vocational agriculture students received below a 2.00 for one term. Ten were on probation for two terms and one was on probation for three terms.

TABLE 12. VOCATIONAL AGRICULTURE STUDENTS ON PROBATION

Terms	No. of Students	No. Below 2.00	% Below 2.00
Fall	83	16	19.3
Winter	72	14	19.4
Spring	67	13	21.0
Mean			19.8

Honor Roll Performance. An average of 4.6 per cent of the vocational agriculture students received term grade-point averages of 3.5 or higher. Of the eighty-three who completed fall term, three or 3.5 per cent earned honor roll grades. Three, or 4.2 per cent of the seventy-two finishing winter term and four, or 6 per cent, of the sixty-seven students who completed spring term received 3.5 or higher. Three students were on the honor roll for one term; two for two terms and one for three terms.

Credit Hours Attempted: Credit Hours Accepted. The vocational agriculture students registered for an average of 15.6 hours per term. The ninety students in their first year attempted a total of 3388 credit hours. The college accepted 3296, or 97.3 per cent of those hours for credit applying toward graduation.

Among the reasons for the difference of ninety-two hours were two: first, failure to have done satisfactory work, thereby, receiving an "F" in a course and getting no credit for it, and secondly, having taken a remedial course for which no credit was intended to be given toward graduation. The vocational agriculture students failed to do passing work in seventy-one hours of the 3388 hours attempted. There were nine hours of remedial mathematics and twelve hours of corrective English taken by the vocational agriculture students for which no credit toward graduation was received.

Performance in Remedial Work. Review mathematics included Math. 5, 10, and 100. Of the ninety vocational agriculture students, there were five who enrolled in Math. 5 as their first remedial mathematics. All five students completed the course and received an average grade-point of 3.00.

There were twenty-seven students assigned to Math. 10, and twenty-four completed the course, the other three having withdrawn without responsibility for a grade. The twenty-four students whose first remedial mathematics course completed was Math. 10 received a grade-point average of 2.63.

There were twenty-nine students who took Math. 100 as their only remedial mathematics course. Of those twenty-nine students, twenty-seven finished the course with one student receiving an "F". The two other students withdrew. The average grade-point received in Math. 100 was 2.48.

The grade point average for work in all remedial Math. was 2.60. This was above the grade-point average for all college work taken by the vocational agriculture group.

There were three students whose second remedial mathematics course was Math. 10. The average performance in this second remedial mathematics was 2.33.

Nineteen students took Math. 100 as their second remedial mathematics course during the first year, was 2.53. Two students failed; one of them, however, repeated the course and received a "D" grade.

Corrective English was taken by seventeen vocational agriculture students. Fourteen completed the course, three having withdrawn from school without credit for course work. Of the fourteen who completed the review of English composition, one earned a letter grade of "A", five a grade of "B", eight a "C", for an average of 2.50.

Performance of All-Freshmen Group.

The data gathered to represent the all-freshman group was not gathered in a follow-up of the students in that group. Rather it was data available only in a summarized form for all the freshmen in engineering. Therefore it records data on students not included within the limitations of this study.

Two measures of performance that applied to the vocational agriculture group were used with the all-freshmen group. However, additional records were available pertaining to number of suspensions for the freshman class as a whole.

Grade-Point Average. The grade-point average for the freshmen in engineering in all years of this study was 2.36.

TABLE 13. GPA FOR THE FRESHMEN CLASSES IN ENGINEERING

Year	1951	1952	1953	1954	1955	1956	Mean
Fall	3.24	2.26	2.34	2.26	2.34	2.28	2.37
Winter	2.30	2.36	2.31	2.45	2.34	2.35	2.30
Spring	2.36	2.41	2.38	2.44	2.45	2.44	2.42
Mean	2.71	2.34	2.34	2.34	2.37	2.34	2.36

The GPA recorded for fall term, 1951 was nearly a full grade-point above the class mean. As this GPA was derived by dividing grade-points earned by credit hours attempted, and this calculation was re-affirmed, no further check of reliability was available.

Incidences of Probation. A mean of 16.7 per cent of the all-freshmen group in engineering received a grade-point average below a 2.00.

TABLE 14. ALL-FRESHMEN ON PROBATION

Term	No. of Students	No. Below 2.00	% Below 2.00
Fall	2581	447	17.3
Winter	2122	356	16.7
Spring	1743	272	15.6
Mean			16.7

TABLE 15. SUSPENSIONS FROM FRESHMEN ENGINEERING CLASSES

	Fall		Winter		Spring		Total		Per Cent
Year	No. Enroll.	No. Susp.	No. Enroll.	No. Susp.	No. Enroll.	No. Susp.	Term Enroll.	No. Susp.	
1951-52	231	3	164	1	123	6	518	10	1.93
1952-53	297	2	245	9	211	6	753	17	2.257
1953-54	378	1	314	9	294	8	986	18	1.82
1954-55	457	2	402	5	334	10	1193	17	1.43
1955-56	599	6	506	26	401	14	1506	46	3.05
1956-57	619	4	491	26	380	11	1490	41	2.75
Total	2581	18	2122	76	1743	55	6446	149	
Mean Percentage		.7		3.6		3.2			2.3

The percentage on probation decreased with each succeeding term, with the high of 17.3 per cent fall terms and the low in the spring terms with 15.6 per cent.

Suspensions From College. The data in Table 15 was available in the office of the engineering school personnel advisor. It demonstrates the number of freshmen enrolled in engineering who were suspended from college. It may be assumed that at least the greatest proportion of these students were suspended because of academic deficiencies.

An average of 2.3 per cent of all freshmen in engineering was suspended from college over the six years covered in this study. The fewest students were suspended after fall term, only .7 per cent. However, with succeeding terms the percentage was higher. After winter term the proportion of students suspended was the highest 3.6 per cent. After spring term 3.2 per cent were suspended.

CHAPTER IV

SUMMARY OF RESEARCH

Conclusions Drawn From The Findings.

From the findings of this study the following conclusions may be made:

1) A conclusion of the related studies cited in this research may have been that, generally, students with a significant experience in vocational agriculture performed in college equally as well as students with no vocational agriculture in high school.

2) Ninety vocational agriculture students were enrolled in the freshmen engineering classes during the period 1951-52 through 1956-57.

3) The vocational agriculture students took an average of 2.5 units of high school mathematics. There was no marked trend in the number of mathematic units per student taken by students with different amounts of agriculture.

4) In high school, the vocational agriculture group completed 1.6 units of the physical sciences per student. Again, no trend was indicated according to the number of agriculture units completed.

5) The mean high school decile of the vocational agriculture group was 7.53; the decile of the all-freshmen group was 7.72.

6) Each vocational agriculture student enrolling in engineering during these six years did so no more than eight years after high

school graduation, and 88 per cent had graduated from high school in Oregon.

7) Remedial mathematics was taken by 68 per cent of the vocational agriculture group and 39 per cent of the all-freshmen group.

8) Nineteen per cent of the vocational agriculture students registered in corrective English; 12 per cent of the all-freshmen group enrolled in corrective English.

Referring to the stated problem of this study, that of determining the academic performance of vocational agriculture students in freshmen engineering, the following conclusions may be made:

9) The grade-point average earned by the vocational agriculture students in freshmen engineering was 2.57, and the mean for the all-freshmen group of engineers was 2.36.

10) Twenty per cent of the vocational agriculture students were placed on probation during the year; 16.7 per cent in the all-freshmen group were placed on probation. Twenty-two per cent of the vocational agriculture group were on probation for one term; 10 per cent for two terms, and one per cent for three terms.

11) Four per cent of the vocational agriculture students earned a grade-point average of 3.5 or higher and therefore were listed on the honor roll.

12) There was a difference in credit hours attempted and credit hours accepted of ninety-two hours. Seventy-one of these hours of course work were not completed satisfactorily, for which an "F" was received. Nine hours of remedial mathematics and twelve hours of

corrective English were taken for which no credit toward graduation was applied. The difference averaged less than one hour per student.

13) The GPA earned in all remedial mathematics was 2.60; the GPA in corrective English, 2.5.

Summary of Research.

Purpose of the Study. The purpose of this study was to determine the academic performance of vocational agriculture students in freshmen engineering at Oregon State College.

Research Procedures. The students selected for this study were high school graduates from the continental United States with two or more units of vocational agriculture who entered the engineering school during the interim 1951-52 through 1956-57. Data on ninety students was gathered from the active student files for the schools of engineering, agriculture, and science, and the files of inactive students and graduates in the school of engineering.

The data for each student were recorded on 3 x 5 inch cards which had been mimeographed with a form to be filled. The margins of the cards were then coded according to student status and to the year of college enrollment.

Summary of Findings. The grade-point average of the vocational agriculture students in freshmen engineering was higher than the average for the all-freshmen group in engineering. The vocational agriculture students averaged 2.57; whereas, the average for all-freshmen in engineering was 2.36.

Areas of Possible Further Study.

Carter, (8) suggested that the apparent advantage in the introductory botany possessed by vocational agriculture students may have been attributed to a similarity of teaching methods in high school vocational agriculture classes and in college botany classes. The individual and group assignment method, for example, was somewhat similar to the group conference plan used in botany.

The effect of using various teaching techniques in different college curricula may be an area for further study. And, more broadly, identifying study skills required in college and devising ways of teaching the use of these study methods is another area for possible study.

If data were obtained for a larger group of vocational agriculture students, correlations may have been calculated in a study such as this. Further research may indicate:

1) Academic performance as to high school decile, ACE deciles, and as to a mean equated decile of the two, to indicate which one or combination may be the best predictor of college performance.

2) Performance in the engineering and agriculture schools as to the number of vocational agriculture units taken in high school.

3) Background and performance of vocational agriculture students who were prepared by their performance on placement examinations to take the standard engineering curriculum.

4) Performance in the engineering school according to the number of science and mathematic units completed in high school.

5) A comparison of the deciles and background of students not completing the first year because of academic reasons, with those students who did complete the first year with satisfactory grades.

Generalizations.

Summary of this study indicates that the vocational agriculture students in engineering perform as well as other freshmen in the same curriculum. This conclusion supports other research, such as the Eight Year Study, which propose that it is the quality of scholarship exhibited, not an exposure to certain courses themselves, which is a greater influence on achievement in college. To the extent that a high school curriculum meets the functional needs of students anddevelopes individual potential, then to that degree is it meeting well the students' need for college preparation.

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