AN ABSTRACT OF THE THESIS OF

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Title A FOLLOW-UP STUDY OF OREGON STATE COLLEGE GRADUATES IN INDUSTRIAL ADMINISTRATION

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Abstract approved _____ (Major Professor)

The industrial administration curriculum was made available at Oregon State College in 1928, with its first graduate in 1930.

The graduates are currently employed mainly as sales personnel, "engineers" - a general term for the performance of work related to engineering applications, managerial heads, or are self-employed. Over half of the graduates responding have held their present positions less than one year. Approximately 40% are employed by firms hiring less than 100 people. A trend toward working for even smaller firms is evidenced.

Manufacturing industries are the chief employers of the industrial administration graduates, with sales companies the second largest group. About 10% of the graduates were self-employed.

Over 60% of the graduates obtained their first employment through a direct contact with the employers, while only 10% obtained positions as a result of interviews at college.

A definite trend toward higher salaries is evident. Nearly half of the responding graduates currently receive between 3000 and 4000 dollars per year. This was the average starting salary of the 1950 graduates of this curriculum.

Over 95% of the graduates transferred to the curriculum after entering college for some other curricular program, while only 1% enrolled directly from high school. Over 60% indicated they chose the program because they were interested in industrial management but not from the traditional engineering standpoint.

Sixty per cent indicated they were satisfied with the advice or counsel given them while nearly a fourth were not satisfied. Apparent deficiencies were a lack of personal approach and a lack of current information about industry.

Nearly 60% indicated their scholastic record played little or no part in their employment, although 94% are satisfied with their employment.

Only one advanced degree was noted while approximately 16% have obtained additional college-level training since graduation.

Accounting and engineering drawing appear to be the two courses considered most beneficial to the graduates.

Indications are that more emphasis should be placed on personnel management and machine design.

The writer makes the following recommendations:

1) The present curriculum be evaluated and, if necessary, modified to place more emphasis upon problems, methods, etc. of firms employing 100 or less persons.

2) An effort be made to familiarize the industrial employers with the qualifications of these graduates.

3) The School of Engineering placement bureau be encouraged and enlarged to further meet the needs of the graduates of this curriculum.

4) The advisory service be thoroughly evaluated and that the advisors incorporate a definite plan in their services to the students in view of the facts found in the study.

5) Further studies be made to determine the benefits to be derived from a graduate program in Industrial Administration at Oregon State College.

6) That the high school contact committee distinguish between industrial administration and the traditional engineering programs in advising students not wanting or able to follow the regular engineering curriculums.

A FOLLOW-UP STUDY OF OREGON STATE COLLEGE GRADUATES IN INDUSTRIAL ADMINISTRATION

by

JAMES JUNIOR MAC LEOD

A THESIS

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APPROVED:

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Head of Department of Industrial Education

In Charge of Major

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Chairman of School Graduate Committee

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Dean of Graduate School

Date thesis is presented May 3, 1951

Typed by Margaret Lieber

The writer takes this opportunity to express his sincere gratitude to Professor George B. Cox for his suggestions and supervision so generously given in the writing of this thesis; to my wife for her constant inspiration and encouragement in this undertaking.

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A FOLLOW-UP STUDY OF OREGON STATE COLLEGE GRADUATES IN INDUSTRIAL ADMINISTRATION

CHAPTER I

INTRODUCTION

Purposes of the study

The purpose of this study is to determine the status of graduates of the industrial administration curriculum with respect to:

a) employment since graduation

b) type of work engaged in by the several graduates

c) advancement since the first three years following graduation

d) present occupation and future outlook

e) recommendations for evaluation and/or improving the curriculum

It is the hope of the writer that the information obtained and the conclusions drawn from this undertaking may be of some value as a basis for future critical evaluation and planning of the curriculum in Industrial Administration.

Historical

Industrial Arts was first organized as a department in the School of Engineering at Oregon State College in 1913. The department awarded its first degree in 1915. From this origin the department has enjoyed a unique and increasing popularity.

The object of the early program was to train manual arts teachers for the public schools, as well as to provide shop facilities for the school of engineering. The next fifteen years showed a definite growth and enrichment of the curriculum. However, the main purposes of the department had not been substantially changed. That period is not of particular importance to this study.

The year 1928 brought with it an important change within the department. It was at that time the curriculum in Industrial Administration was introduced as a phase of the Industrial Arts Department. The first graduate of the new curriculum received his diploma in 1930. The "Industrial Shop Administration" curriculum, as it was known then, came out of the long felt need by industry for men with a technical knowledge of industry, along with a basic understanding of industrial organization and management. The curriculum was unique in that it is considered to be the first of its type in the United States.

Perhaps the best definition of the purposes of the new addition may be obtained from the first description given in the Oregon Agricultural College Catalogue. (2, p.230)

> The curriculum in industrial shop administration parallels that of general industrial arts for the first two years. Specialization during the junior and senior years involves further study of the basic sciences, industrial organization and management, labor problems, cost accounting, and production control. This curriculum is designed to meet the increasing demand for workers in industry who are trained in the basic sciences and in the fundamentals

> of industrial organization and management, and who, through their knowledge of technical and industrial operations, can work quickly and efficiently into junior executive positions. Provision is made for election of both technical and non-technical subjects that will meet the needs of individual students.

The growth of enrollment in the curriculum has been constant with the years. At first, only a few students were interested, but this number has increased steadily and is especially noteworthy after World War II when a sudden impetus is apparent. Figure 1 shows the growth of this curriculum in terms of its graduates.

The program has been modified considerably since its origin some twenty years ago. Under the expert guidance of Professor George B. Cox, the curriculum has broadened and grown stronger with its increased growth in popularity.

The program today incorporates three main groups or options: 1) Metal Industries, 2) Wood Industries, and 3) Tool Design. These options, plus a large selection of electives, enable the student to plan a program to fit his individual needs. Copies of the present phases of the curriculum may be found in Appendix A.

A general comparison made between the first catalogue mentioned and that found in the current issue is of interest. (3, p.340)

> The industrial administration curriculum is designed to meet the ever-increasing demand in industry for men with basic skills and technical knowledge, supplemented with studies in scientific management and in business administration. This program of studies includes those accepted principles and

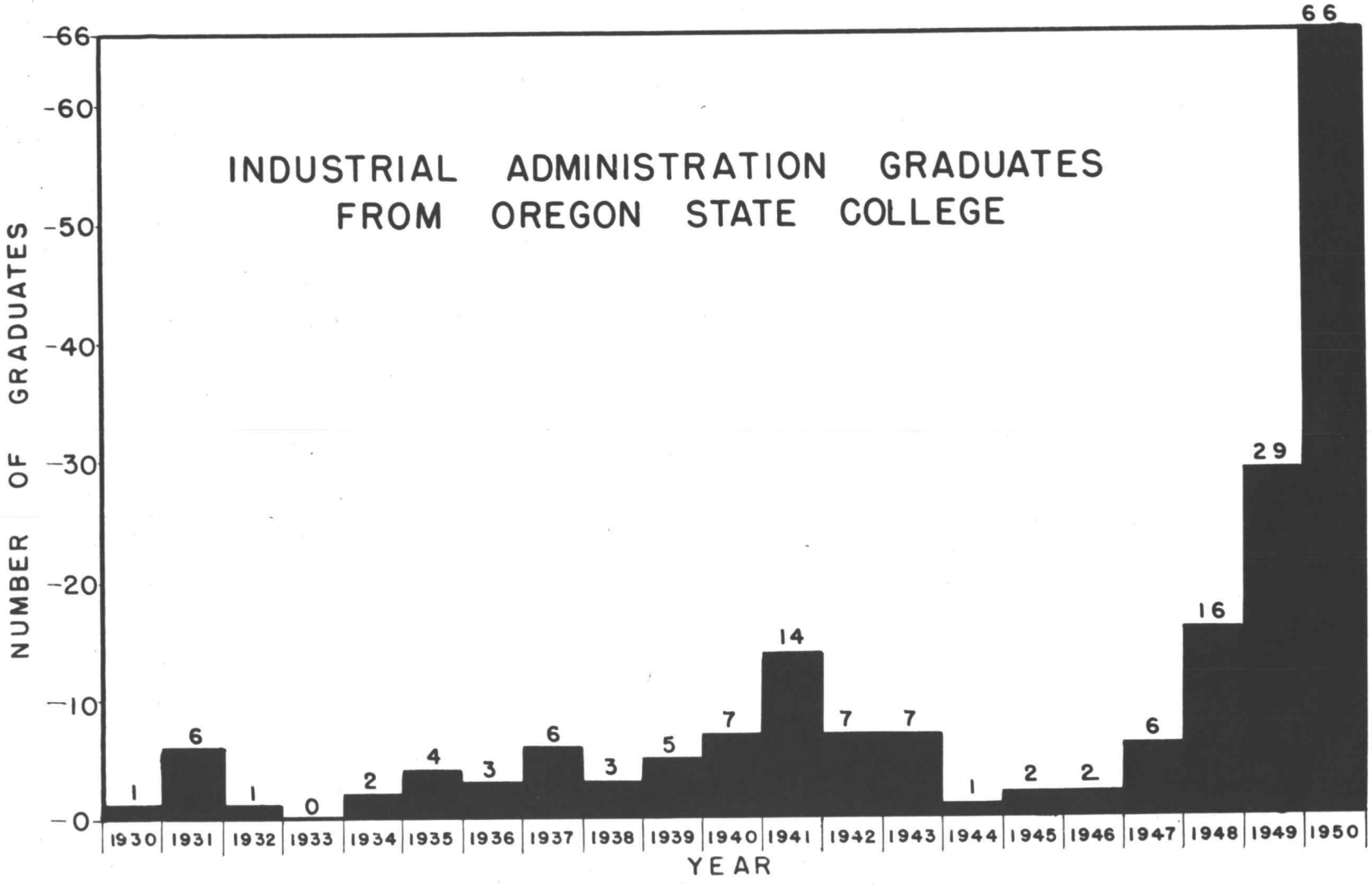
INDUSTRIAL ADMINISTRATION GRADUATES
FROM OREGON STATE COLLEGE
NUMBER OF GRADUATES
YEAR
0
10
20
30
40
50
60
66
1 6 1 0 2 4 3 6 3 5 7 14 7 7 1 2 2 6 16 29 66
1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950

FIG. 1

> practices by which the manufacturing industries have evolved a system of production control, giving optimum results to the community, the consumer, the worker, and the manufacturer. Correlation of the technical studies, manufacturing processes, and management principles is emphasized to the extent that graduates of this curriculum can progress to supervisory and junior executive positions. The options (Metal Industries, Wood Industries, Tool Design) and the electives enable the student to specialize in the particular phases of industry consistent with his interests and aptitudes. The program affords a rich opportunity to combine technical training and business application in industrial maintenance and in the improvement of service occupations, such as technicians in industry, assistant managers, and time-study men.

With the ever increasing demand from industry for graduates plus the interest shown by students, it is apparent that this curriculum fills a definite need.

Similar studies

In 1940, Edwin D. Meyer made a follow-up study of industrial arts graduates of Oregon State College since 1915. (1, pp.1-107) This study included a history of the department from its origin, and a follow-up of the work of its graduates.

Industrial Administration graduates were included in the study as they were a part of the Industrial Arts Department. Very little emphasis was placed on this group as there were only twenty-eight at that time and the program was in its infancy.

The writer will utilize the material presented in the above mentioned thesis wherever possible to make comparisons

that will aid further the purposes of the present study.

It is deemed inadvisable to elaborate further on the history of industrial arts at Oregon State College. Meyer covered the history very thoroughly and a presentation here would be merely a duplication.

Methods employed

The names of the graduates were secured from the Industrial Arts Department and from the office of the Dean of Engineering.

Whenever a graduate's program was questionable as to the curriculum followed, his records were checked in the office of the registrar.

Addresses were obtained from the department office, the dean of engineering's office, and the alumni office. The personnel in charge of these various records were very cooperative and often spent a considerable time in helping to locate strayed reports.

A questionnaire[1] was sent to all the known living graduates. The department has graduated 188 persons in Industrial Administration, with two listed as deceased. A letter of transmittal[2] accompanied each questionnaire.

A follow-up letter[3] was sent to all the graduates previously contacted, but who had not responded after twenty

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[1] A copy may be found in Appendix B
[2] See Appendix C for copy
[3] See Appendix D

days. A second copy of the questionnaire was enclosed, with the hope that more responses would be obtained.

The questionnaire contained twelve sections, some with several parts. In most cases response to the items under consideration could be made by checking the proper blank, thus reducing the time required to fill out the questionnaire.

Recommendations were asked for in several instances and an evaluation of the program was requested.

The letter of transmittal encouraged additional comments on the back of the questionnaire form. Many of the graduates used this means for explaining any unusual circumstances.

Limitations

It has now been twenty years since the first degree was granted in Industrial Administration. This factor alone constitutes a very definite limit as these graduates have moved to many far-away places and their personal contacts here have been lost.

World War II occurred during the twenty-year period covered by this study. This constitutes the second large factor in curtailing the desired results. Many of the graduates were either in the military service or took jobs in war industries, with a consequent loss of contact at the college.

A questionnaire itself has definite limitations due to possible misinterpretation and lack of complete answers. Much care was taken in the preparation of this questionnaire and the writer feels that the answers received showed little misunderstanding of the questions.

In general, the writer feels that the lack of current addresses is the limiting factor in this study. It should be stated that much care and effort were expended in securing these addresses. Some thirty-five questionnaires were returned for lack of current address. All of these questionnaires were sent out again and some even a third time, in the hopes of contacting the individual. Home addresses of student days were used in many cases in the hope that the letters would be forwarded.

The writer also fully realizes that conclusive results may not be taken from a study involving the few responses found here. It is firmly believed that the results of even the limited survey tend to show trends and will be of some benefit in the future, though of limited scope.

Value of the study

The value of any curriculum is found in the way it helps its individual participants. It is the work of the graduates, their success or failure, that tells the story of the adequacy of their training.

The writer sincerely hopes that the results of this

study may form a basis upon which to evaluate the current industrial administration curriculum.

It is further hoped that the results found here may help in the counseling and guidance of future students. It is generally accepted that a strong future is at least partially based upon the experiences and mistakes of the past. It is upon the basis of a compilation of facts about graduates of the Industrial Administration curriculum that the writer foresees a definite value in future counseling.

CHAPTER II

THE STUDY

The department of Industrial Arts has graduated 188 in Industrial Administration. Two of these graduates have died since leaving the college. Questionnaires were sent to the last known addresses of the remaining 186. Seventeen were returned by postal authorities due to lack of current addresses. Even after repeated attempts, it was impossible to contact these individuals, therefore, it may then be assumed that 169 of the graduates were actually contacted. From those contacted, 87 responses were received. This number represents 51% of those contacted and 47% of all the known living graduates of Industrial Administration at Oregon State College.

It is the purpose of this study to obtain information about the graduates during the first three years following graduation, as well as to learn their present status.

Duplication of answers will occur in several places as it must be remembered that only those persons graduating prior to 1948 will have passed through the three-year period used in the comparative phase of this study. The duplications will appear specifically in the responses of those persons graduating in 1948, 1949, and 1950.

Types of positions held

The type of position that a person holds during the few years following his graduation from college is important in that satisfactory employment is an important objective of attending college. The thoroughness and usefulness of a person's college career is often reflected in the type of position he holds in his chosen field.

Question "3-a" was used in an effort to determine the type of position held by the various graduates in the three years immediately following graduation. As would be expected, many varied responses were received to this question.

TABLE 1

TYPE OF POSITION, DURING FIRST THREE YEARS AFTER GRADUATION

TYPE OF POSITION	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
Trainees (all types)	6	6.9
Sales (wholesale, retail, engineer, supervisor)	6	6.9
Trades (helper, apprentice, journeyman, foreman)	11	12.6
Production (control, quality, routing, cost)	10	11.5
Engineers (industrial, junior, tool, experimental)	13	14.9
Plant superintendent; manager; supervisor; assistant manager; department manager	10	11.5
Appraisal; insurance; inspection	5	5.7
Bookkeeper; teller; clerk (all types)	5	5.7
Military service; civil service; government work	4	4.6
Teaching	3	3.4
Self-employed	3	3.4
Drafting; designing	5	5.7
Purchasing agent	0	---
Construction work (all phases)	1	1.1
Field representatives (all types)	2	2.3
Radio announcer; radio engineer	1	1.1
Technician; metallurgist	2	2.3
TOTAL RESPONSES	87	

Table 1 shows the number of graduates in each type of employment. These types were grouped arbitrarily as representing similar kinds of employment. Some of the questionnaires listed several positions during this three-year period. In such cases, these comparisons are based upon the highest type of position held during the period in question.

By a slight margin, the greatest number of the graduates were employed as "engineers" of some type. That classification accounted for 14.9%, while 12.6% of the graduates were employed in the trades, 11.5% were employed as superintendents, managers, or assistant managers (largely in industry), and 11.5% were in production and cost control positions. The graduates employed in these four categories during the initial three-year period of work represent 50.5% of the total number.

To compare the initial employment classifications with later (present) positions as an indication of the progress of the graduates, note the response to question "4-a", shown in Table 2.

TABLE 2

TYPE OF POSITION AT THE PRESENT TIME

TYPE OF POSITION	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
Trainees (all types)	4	4.6
Sales (wholesale, retail, engineer, supervisor)	9	10.3
Trades (helper, apprentice, journeyman, foreman)	3	3.4
Production (control, quality, routing, cost)	6	6.9
Engineers (industrial, junior, tool, experimental)	13	14.9
Plant superintendent; manager; supervisor; assistant manager; department manager	9	10.3
Appraisal; insurance; inspection	5	5.7
Bookkeeper; teller; clerk (all types)	4	4.6
Military service; civil service; government work	3	3.4
Teaching	6	6.9
Self-employed	11	12.6
Drafting; designing	4	4.6
Purchasing agent	2	2.3
Construction work (all phases)	3	3.4
Field representatives (all types)	2	2.3
Radio announcer; radio engineer	1	1.1
Technician; metallurgist	1	1.1
No answer	1	1.1
TOTAL RESPONSES	87	

A comparison of Tables 1 and 2 shows a slight drop in the number of trainees, possibly indicating that graduates leaving college enter company schools or train for specialized positions within the firms. An increase of 3.4% is noted in the number of persons holding some type of sales position, while a decrease of 9.2% is noted in the number employed in the various phases of the trades. This might indicate promotion to managerial positions for this group or it might mean that they have possibly entered their own business as a corresponding increase is noted in the number of self-employed persons.

A decrease of 4.6% is noted in those employed in production control work. The numbers employed in engineering work remained constant.

At the present time 35.5%, or slightly over one-third of the graduates, are employed in sales, engineering, or managerial positions.

As a matter of comparison, the graduates of 1947 and those of previous years were segregated. Table 3 gives the responses of the 1947 graduates to questions "3-a" and "4-a".

TABLE 3

TYPE OF POSITION HELD BY THE GRADUATES OF 1947 OR PRIOR YEARS DURING THEIR FIRST THREE YEARS AFTER GRADUATION

TYPE OF POSITION	DURING THEIR FIRST THREE YEARS	AT PRESENT TIME
Trainees (all types)	0	0
Sales (wholesale, retail, engineer, supervisor)	0	4
Trades (helper, apprentice, journeyman, foreman)	4	0
Production (control, quality, routing, cost)	2	1
Engineers (industrial, junior, tool, experimental)	9	4
Plant superintendent; manager; supervisor; assistant manager; department manager	4	3
Appraisal; insurance; inspection	1	1
Bookkeeper; teller; clerk (all types)	2	1
Military service; civil service; government work	3	2
Teaching	1	4
Self-employed	0	6
Drafting, designing	1	0
Purchasing agent	0	1
Construction work (all phases)	0	1
Field representatives (all types)	0	0
Radio announcer; radio engineer	0	0
Technician; metallurgist	1	0
TOTAL RESPONSES	28	28

More definite changes are noted in this group than for those given in Tables 1 and 2. Self-employment is particularly noticeable in that six of the graduates have become self-employed after starting in other positions. Three of the graduates entered the teaching field three or more years after graduation. Four graduates indicated they are employed in some type of sales work where none held such positions during the three-year period following graduation.

Five graduates left jobs as engineers to take other positions and four, who started out in the trades, have obtained other positions, possibly represented by the "self-employed" group.

As a matter of interest, the individual positions of the graduates of 1947 and prior years are listed in Table 4.

In reading across Table 4 one may find the relative advancement of the graduates after a given number of years out of school. Only those giving complete answers were listed. A general individual advancement is noted for the graduates represented by the table.

TABLE 4

RELATIVE ADVANCEMENT OF THE
INDIVIDUAL GRADUATES OF 1947 AND PRIOR YEARS

POSITION DURING FIRST THREE YEARS	LENGTH OF TIME SINCE GRADUATION	PRESENT POSITION
Process planning	9 yrs. ..	production manager
General manager of woodworking plant ..	3 yrs. ..	logging contractor
Stationary stock clerk ..	12 yrs. ..	chief, accounts payable department
Metallurgist	7 yrs. ..	assistant professor
Carpenter	19 yrs. ..	self-employed
Industrial valuation engineer	9 yrs. ..	valuation engineer
Operation supervisor	14 yrs. ..	operation supervisor
Production control clerk	9 yrs. ..	aeronautical engineer
Manufacturing engineer ..	9 yrs. ..	gas-oil salesman
Drafting and designing ..	9 yrs. ..	engineer-draftsman
Assistant production manager	10 yrs. ..	purchasing agent
Photo-survey, Forest service	19 yrs. ..	partner in oil business
Ordnance officer, U.S.N.	8 yrs. ..	auto dealer
Industrial engineer	7 yrs. ..	self-employed
Shift milling foreman ...	4 yrs. ..	plant engineer
Fire insurance engineer .	3 yrs. ..	general insurance
Experimental engineer ...	3 yrs. ..	instructor
Teacher	3 yrs. ..	teacher
Industrial engineer	6 yrs. ..	assistant professor
Army officer	8 yrs. ..	army officer
Jr. industrial engineer .	9 yrs. ..	army officer
Jr. industrial engineer .	7 yrs. ..	partner in oil business
Forge engineer	5 yrs. ..	owner- manufacturing company
Junior engineer	14 yrs. ..	assistant sales manager
Lot clerk in treasury disbursing office ..	18 yrs. ..	supervisor of precision inspection
Bus operator	12 yrs. ..	chief dispatcher
Welder	15 yrs. ..	own manufacturing business
Assistant supervisor of personnel	8 yrs. ..	dairy farmer

In respect to the graduate's present position, it is interesting to note the responses to question "4-b" as to the length of time in the present position.

TABLE 5

LENGTH OF TIME IN PRESENT POSITION

LENGTH OF TIME	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
Less than 6 months	17	19.5
½-1 year	27	31.0
1-1½ years	9	10.3
1½-2 years	9	10.3
2-3 years	8	9.2
3-4 years	6	6.9
4-5 years	1	1.1
5-7 years	5	5.7
7-10 years	0	---
10-15 years	1	1.1
15-25 years	1	1.1
No answer	3	3.4
TOTAL RESPONSES	87	

Table 5 shows that the largest percentage (31%) of the graduates have held their present positions from six months to one year. Nearly 20% have been in their present position less than six months. A corresponding drop in the number

employed in "present positions" for longer periods is noted. Of those responding, 50.5% indicated they have held their present positions less than one year. Only 7.9% of the graduates indicated they have been in their present position over five years.

The facts presented in Table 5 undoubtedly have a direct bearing on the foregoing types of positions held. The fluctuation in positions would result from the relatively short tenure in their present positions.

The large number of graduates in 1948, 1949, and 1950 undoubtedly influenced the percentages in the short tenure groups.

Types and sizes of firms employing the graduates

The types and sizes of firms employing industrial administration graduates is important to the curriculum in general. The training of students for entry into the larger concerns, where jobs are more specialized, should possibly be more specific, while those training for small business should have a broad general background.

Questions "3-b" and "3-c" were designed to find the general trend in the type and size of firms employing the graduates of this program. As would be expected, nearly every type and size of firm is represented in the returns.

Approximately 40% of the industrial administration graduates responding to this survey had worked for large,

nationally recognized companies during the first three years of employment. Included within this group are firms such as those listed below:

1. Aluminum Company of America
2. Boeing Aircraft Company
3. Standard Oil Company
4. Westinghouse Electric Corporation
5. Montgomery, Ward and Company
6. Lockheed Aircraft Corporation
7. B. F. Goodrich
8. International Business Machine Company
9. Sears, Roebuck and Company
10. General Mills Corporation
11. Shell Oil Company
12. Allis-Chalmers Company

Approximately 40% of the graduates worked for small locally-owned firms. Motor companies, lumber companies, sawmills, appliance companies, woodworking plants, schools, and builder's supply firms dominate this group.

The remaining 20% of the graduates worked initially for larger locally-owned concerns. This group of employers may be distinguished from the first in that they are not so well known on a national scale. The Hyster Company, the City of Portland, Electric Steel Foundry, Willamette Iron and Steel, Oregon State College, the State Tax Commission, and the First National Bank of Portland are typical of the firms considered in this group.

In cases where the graduate indicated he had worked for several firms, the largest firm was used in these comparisons.

A more concise view of the size of the firms involved

may be obtained by the number of persons employed, as indicated in Table 6.

TABLE 6

SIZE OF FIRMS EMPLOYING THE GRADUATES IN TERMS OF NUMBERS OF EMPLOYEES

NUMBER OF EMPLOYEES	NUMBER OF GRADUATES EMPLOYED			
	DURING FIRST THREE YEARS	PER CENT OF RESPONSES	AT PRESENT TIME	PER CENT OF TOTAL
Less than 5	2	2.3	7	8.1
5 to 10	6	6.9	8	9.2
10 to 15	4	4.6	7	8.1
15 to 20	1	1.1	0	---
20 to 30	2	2.3	2	2.3
30 to 40	3	3.4	4	4.6
40 to 50	1	1.1	1	1.1
50 to 75	6	6.9	4	4.6
75 to 100	3	3.4	2	2.3
100 to 150	1	1.1	4	4.6
150 to 200	3	3.4	2	2.3
200 to 250	3	3.4	4	4.6
250 to 300	1	1.1	1	1.1
300 to 400	3	3.4	2	2.3
400 to 500	2	2.3	1	1.1
500 to 750	5	5.7	7	8.1
750 to 1000	2	2.3	2	2.3
1000 to 2000	5	5.7	5	5.7
2000 to 3000	6	6.9	3	3.4
3000 to 5000	3	3.4	0	---
5000 to 7500	3	3.4	0	---
7500 to 10000	2	2.3	0	---
Over 10000	7	8.1	9	10.3
No answer	13	14.9	12	13.8
TOTAL RESPONSES	87		87	

The numbers of employees as shown in Table 6 were picked arbitrarily, merely as a comparative measure.

As noted in Table 6, the graduates have worked for

firms employing nearly all the categories listed. During the first three years of employment, 29.8% of the graduates worked for firms employing over 1000 people, while only 19.4% are currently employed by firms of this size.

There seems to be a tendency for graduates to be attracted toward smaller firms. During the first three years of employment, 32% of the men worked for firms employing less than 100 people. In their present positions, 40.3% of the graduates work for firms employing 100 persons or less. This is further shown by the fact that nearly 14% of the graduates were initially employed by firms hiring less than 15 persons. At present, 25.4% are employed by these small firms.

Firms employing between 100 and 1000 persons show little variation in the number of graduates, as between initial employment and later years.

From the responses to question "3-b" the writer determined the type of business in which the firms were engaged.

TABLE 7

TYPES OF FIRMS EMPLOYING INDUSTRIAL ADMINISTRATION GRADUATES DURING THE FIRST THREE YEARS AFTER GRADUATION

TYPE OF BUSINESS	NUMBER OF FIRMS	PER CENT OF TOTAL
Manufacturing (all phases)	70	56.5
Wholesale and retail sales	15	11.8
Engineering and research	5	4.0
Construction (all phases)	4	3.2
Insurance and appraisal	6	4.8
Military service, civil service, and government work	10	7.9
Educational institutions	3	2.4
Public utilities and service	6	4.8
Oil products	7	5.6
TOTAL	126	

A total of 126 firms were listed as employing the various graduates during the first three years following graduation. It is obvious that firms engaged in manufacturing hire more graduates than any other single type of business, as 56.5% of the companies mentioned were engaged in this type of work. Companies engaged in sales work of various kinds are the next largest employers of industrial administration graduates, with 11.8% of all the firms mentioned engaged in sales work.

The graduates were asked (question "4-c") the type of

business in which their present employer is engaged. The responses to this question are tabulated in Table 8.

TABLE 8

TYPE OF BUSINESS ENGAGED IN
BY THE GRADUATES' PRESENT EMPLOYERS

TYPE OF BUSINESS	GRADUATES EMPLOYED AT PRESENT TIME	PER CENT OF TOTAL RESPONSES
Manufacturing (all types)	37	42.5
Wholesale and retail sales	15	17.2
Engineering and research	2	2.3
Public utilities and service	4	4.6
Construction (all phases)	7	8.1
Oil products (all phases)	6	6.9
Insurance and appraisal	5	5.7
Military service, or government work ..	2	2.3
Educational	5	5.7
No answer	4	4.6
TOTAL RESPONSES	87	

Table 8 shows that the firms now employing the graduates are essentially little different from the firms given in Table 7. Over 40% of the firms are engaged in manufacturing while 17.2% are engaged in some type of sales work.

A drop of 5.6% is noted in the number of government agencies employing the graduates between the initial three

years and the present time.

More firms are engaged currently in construction work than in the first three-year period. This no doubt is due partially to the great increase in building, and consequent high wages of the past few years.

Question "3-e" was used to find the tendency of the graduates to be self-employed during the first three years following graduation. The results are shown in Table 9.

TABLE 9

SELF-EMPLOYMENT DURING FIRST THREE YEARS

	RESPONSES	PER CENT OF TOTAL RESPONSES
Self-employed	9	10.3
Not self-employed	75	86.1
Part of the time	2	2.3
In addition to regular employment ..	1	1.1
TOTAL RESPONSES	87	

Only 10.3% of the graduates indicated they were self-employed, while 86.1% were not. Two graduates indicated they were partly self-employed while one indicated he was self-employed in addition to his regular position.

Methods of obtaining employment

A question of great importance, especially to college seniors, is: "How do I obtain employment?"

In this regard it should be noted that, until recently, the college has not maintained a placement bureau for graduates of this curriculum. Some progress was made last year and expanded this year for processing these people through the engineering placement channels.

TABLE 10

HOW GRADUATES OBTAINED THEIR FIRST EMPLOYMENT

METHOD USED	RESPONSES	PER CENT OF TOTAL RESPONSES
Interviewed at college	9	10.0
Employment agency	6	6.7
Through friend or relative	17	18.9
Direct contact with employer	55	61.1
No answer	3	3.3
TOTAL RESPONSES*	90	

* Some responses indicated that more than one method was used.

The answers received to question "3-f" are found in Table 10. Most of the graduates, 61.1%, obtained their first positions through direct contact with their employers. Seventeen indicated they received their first position through a friend or relative. This represents 18.9% of the

graduates. Only nine persons, or 10% of the graduates reporting, received positions as a result of interviews at college, while six persons, or 6.7%, used employment agencies as a means of obtaining employment

The question, "How was your present job obtained?", received the results noted in Table 11.

TABLE 11

HOW THE GRADUATES' PRESENT JOBS WERE OBTAINED

METHOD	RESPONSES	PER CENT OF TOTAL RESPONSES
Through friend or relative	16	18.4
Employment agency	3	3.4
Direct contact with employer	50	57.5
Other methods	13	14.9
No answer	5	5.7
TOTAL RESPONSES	87	

These results show a great similarity to those on the corresponding question about first employment. The largest number (57.5%) of the graduates indicated their present positions were obtained through direct contact with their employers. Eighteen per cent obtained their present job through friends or relative, while only 3.4% used employment agencies as a means of obtaining employment. The 13 graduates indicated by "other methods" listed the following as

means of obtaining employment.

a. Seven, by becoming self-employed
b. Three, by advancing in the same firm
c. Two, by answering advertisements
d. One, by civil service examination

Salary

The graduates were asked to give the highest salary received during the first three years of their employment. The answers were grouped as a means of comparison and Table 12 compares these salaries with present salaries.

TABLE 12

SALARIES RECEIVED BY THE GRADUATES

SALARY GROUP	RESPONSES FOR FIRST THREE YEARS OF EMPLOYMENT		RESPONSES FOR PRESENT EMPLOYMENT	
	NUMBER	PER CENT	NUMBER	PER CENT
Less than $1500	2	2.3	0	---
1500 to 2000	2	2.3	1	1.1
2000 to 3000	6	6.9	4	4.6
3000 to 4000	47	54.0	40	46.0
4000 to 5000	15	17.2	16	18.4
5000 to 6000	2	2.3	11	12.6
6000 to 7000	3	3.4	3	3.4
Over 7000	1	1.1	7	8.1
No answer	9	10.3	5	5.7
TOTAL RESPONSES	87		87	

A definite trend toward higher salaries is noted from the above. The two lowest brackets indicated in the first three years of employment contained graduates of the "thirties" when wages were considerably lower than at present.

During the first three years of employment, 54% of the graduates received between 3000 and 4000 dollars per year, 17.2% received from 4000 to 5000 dollars, while only 6.8% received over 5000 dollars. Less than 12% received under 3000 dollars during the initial period of employment.

The present salaries tend to be higher, as would be expected. The 3000 to 4000 dollars per year bracket contains 46% of the graduates, while 18.4% receive 4000 to 5000 dollars per year. More than 24% of the graduates receive over 5000 dollars per year, as compared to only 6.8% during the first three-year period. Less than 3000 dollars per year is currently received by 5.7% of the graduates, as compared to 11.5% in the first three years. An increase of 7% is noted in the "over $7000" group. It is interesting to note that, according to Table 13, at least five of the seven persons currently receiving over 7000 dollars per year are graduates of 1947 or previous years.

The graduates of 1947 and previous years are again segregated as to wages. The writer believes that a truer impression may be had from the statistics of the older graduates. Table 13 shows the highest salary received within

three years after graduation, the number of years since graduation, and the present salary.

TABLE 13

SALARIES OF GRADUATES OF 1947 OR PRIOR YEARS

HIGHEST SALARY DURING FIRST THREE YEARS OF EMPLOYMENT	TIME SINCE GRADUATION	PRESENT SALARY GROUP
2288	19 yrs.	Over 7000
1800	19 yrs.	4-5000
1320	18 yrs.	5-6000
3200	14 yrs.	5-6000
1680	12 yrs.	4-5000
960	12 yrs.	3-4000
2400	10 yrs.	3-4000
4200	9 yrs.	5-6000
3720	9 yrs.	3-4000
2600	9 yrs.	4-5000
3000	9 yrs.	Over 7000
3600	8 yrs.	1500-2000
24-30,000	8 yrs.	28,000
3600	7 yrs.	3-4000
3900	7 yrs.	3-4000
4500	7 yrs.	3-4000
4200	6 yrs.	4-5000
4200	5 yrs.	Over 7000
4380	4 yrs.	6-7000
3600	3 yrs.	3-4000
2400	3 yrs.	5-6000
4500	3 yrs.	4-5000
6000	3 yrs.	Over 7000

To obtain an idea of the current "starting" salary of the graduates, the class of 1950 was studied as a group. Their starting salary is assumed to be their first year's wages, as tabulated in Table 14.

TABLE 14

SALARIES OF THE 1950 GRADUATES

SALARY	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
Less than 1500	0	----
1500 to 2000	0	----
2000 to 3000	4	11.8
3000 to 4000	24	70.6
4000 to 5000	3	8.8
5000 to 6000	1	2.9
6000 to 7000	0	----
Over 7000	1	2.9
No answer	1	2.9
TOTAL RESPONSES	34	

The 34 responses in Table 14 represent 51.5% of all those graduating in 1950. As will be noted, the majority of the graduates receive 3000 to 4000 dollars per year. Only one person fell in the "over $7000" bracket, while no graduates received less than 2000 dollars. A starting salary of from 2000 to 5000 dollars was received by 91.2% of the graduates.

Number of different firms by which each graduate has been employed

Table 15 is the tabulation of results given to question "4-f".

TABLE 15

THE NUMBER OF FIRMS FOR WHICH THE GRADUATES HAVE WORKED

NUMBER OF FIRMS BY WHICH EMPLOYED	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
One firm	43	49.4
Two firms	19	21.8
Three firms	14	16.1
Four firms	1	1.1
Five firms	2	2.3
Six firms	2	2.3
Seven firms	1	1.1
Eight firms	2	2.3
No answer	1	1.1
Self-employed	2	2.3
TOTAL RESPONSES	87	

Over 49% of the graduates have worked for only one firm since leaving college, while approximately 22% have worked for two firms, and 16% have worked for three. Those working for three or less firms make up 87.3% of the total responses. The large graduating classes of the past few years must be remembered in this connection, although they hardly compensate for these large percentages.

Satisfaction with choice of occupation

The writer believes that the degree with which one is satisfied with his choice of occupation is very important. Question "5" was used in an effort to determine how well the graduates are satisfied with their choice of occupation. The responses are given in Table 16.

TABLE 16

DEGREE OF SATISFACTION WITH CHOICE OF OCCUPATION

DEGREE	NUMBER OF RESPONSES	PER CENT OF TOTAL RESPONSES
Very well satisfied	50	57.5
Satisfied	32	36.8
Unsatisfied	4	4.6
Very unsatisfied	0	----
No answer	1	1.1
TOTAL RESPONSES	87	

The results of Table 16 are rather surprising. It was indicated that 57.5% of the graduates are well satisfied, while only 4 (4.6%) are unsatisfied. Thirty-two (37%) indicated they are satisfied but not to the fullest extent. No indication was given as to the reason these graduates classified themselves less than "very well satisfied".

When industrial administration was chosen as a career

The time at which the various graduates chose to enter the industrial administration curriculum was asked in question "1", with the results tabulated in Table 17.

TABLE 17

TIME AT WHICH INDUSTRIAL ADMINISTRATION WAS CHOSEN AS A CAREER

TIME	RESPONSES	PER CENT OF TOTAL RESPONSES
During high school	1	1.1
During work experiences after high school	3	3.4
First two years of college	67	77.0
Second two years of college	16	18.4
TOTAL RESPONSES	87	

Only one person chose to enter the curriculum during high school and only three chose the curriculum during work experiences after leaving high school. Seventy-seven per cent of the graduates entered the curriculum during their first two years at college and 18% during their last two years at college. This means that more than 95% of the graduates transferred to the curriculum after entering college.

This question seems of extreme importance to the

writer. Specifically, the fact that only 1.1% of the graduates enrolled directly from high school is very significant. Further studies to determine the reason for this particular trend, as well as the relatively high number transferring after two or more years in college, would appear to be very interesting and revealing.

Why the industrial administration curriculum was chosen

The answers to question "2" are also thought to be revealing.

TABLE 18

REASONS FOR CHOOSING THE INDUSTRIAL ADMINISTRATION CURRICULUM

REASON	RESPONSES	PER CENT OF TOTAL RESPONSES
Position offered dependent upon college training	2	2.2
Pay offered in the field	2	2.2
Interested in industrial management but not from an engineering standpoint	57	62.0
Other reasons	31	33.7
TOTAL RESPONSES*	92	

* A larger total appears here due to the fact that some of the graduates indicated several reasons for choosing the industrial administration curriculum.

Only two graduates indicated they chose the industrial administration curriculum because of positions offered

dependent upon college training. Only two of the graduates chose the curriculum because of the pay offered in the field. The largest number, 57 persons, or 62%, chose the curriculum because they were interested in industrial management but not from an engineering standpoint. This particular group interests the writer as it seems very probable this may be the partial answer to the results found in Table 17. Perhaps some of these people started in other curriculums and changed, due to interests or scholastic difficulties.

The group that marked "other reasons" on the questionnaire numbered 31 persons, or 33.7% of the responses. The only trend apparent to the writer from the comments is that many of the graduates were interested in engineering but not from the technical approach used in the actual engineering curriculums. They found that the industrial administration curriculum offered them a fair understanding of engineering, along with a good opportunity to work in industry. It should be noted that the industrial engineering curriculum was not available until 1942. Some of the graduates before that time chose industrial administration because it was the closest available approach to industrial engineering. It should further be noted that the industrial administration curriculum was organized largely as an outlet for students interested in a technical education, but without sufficient interest in or ability for advanced mathematics and sciences

to pursue the traditional engineering programs. These factors, especially the latter, should appear more obvious from the comments but were, no doubt, reduced in favor of reasons which appeared more commendable to the individuals. The writer deems it desirable to include (in Appendix E) a speech prepared by Professor George B. Cox which fully explains and substantiates the previous statements.

Most of the comments are personal preferences and show no definite trend. The comments received are listed below.

1. Had followed that type of work.
2. Wanted to sell industrial equipment.
3. Liked the flexible curriculum.
4. Wanted a combination of business and engineering.
5. Thought it a well-balanced curriculum.
6. Interested in industrial management and engineering.
7. Had work experience with father in building construction.
8. Was working way through college and this curriculum required less outside study.
9. Wanted position in management but through engineering rather than business administration channels.
10. Interested in tool engineering.
11. Talked into it by friend.
12. Interested in general engineering subjects.
13. Wanted it as a background for hardware business due to previous experience.
14. Wanted to get business and management courses with engineering.
15. Thought by advisor that it was what he wanted.
16. Offered wider field of various types of jobs.
17. Seemed best suited to abilities.
18. Wanted industrial management from an engineering standpoint.
19. Recommended by veteran's guidance examination.
20. Desired a change.
21. Came as close to construction field as any offered.
22. Interested in building construction.
23. Seemed nearest to industrial engineering at that time.
24. Interested in woodwork and construction.
25. Wanted tool design option.
26. Influenced by advisor.

27. Interested in machine production.
28. Seemed most in line with interests.
29. Seemed most nearly fitted to personal requirements.
30. Interested in creation with tools.

Satisfaction with advice or counsel

The responses to question "8" were the most interesting of the study. The results are tabulated below.

TABLE 19

WAS THE ADVICE OR COUNSEL GIVEN TO YOUR SATISFACTION?

	RESPONSES	PER CENT OF TOTAL RESPONSES
Yes	53	60.9
No	20	23.0
No answer	14	16.1
TOTAL RESPONSES	87	

Fifty-three of the graduates, or 60.9%, indicated they thought the advice or counsel was satisfactory, while 20 persons, or 23%, indicated that it was not satisfactory. Sixteen per cent did not answer the question. The writer found upon examination that many of the graduates, after marking "yes", gave some suggestions which would lead one to believe that the answers should have been "no".

Many suggestions and comments were given, as listed in Appendix F. One immediately senses several things from reading these comments. Some are due undoubtedly to

personal feelings, while others are unbiased judgments. Still others may be overlooked as being impracticable, or they are already in operation without the student's awareness of that fact. With the development of the curriculum, several of these ideas have been incorporated without the knowledge of many of the older graduates.

It appears to the writer that two criticisms stand out. First, that advisors need to show a more personal interest in the students. Second, the advisors should be allowed more time for counseling and should adhere to strict conference schedules.

Part scholastic record has played in employment

The writer chose four comparative groups with reference to the degree of importance placed upon scholastic records. The results to question "10" are tabulated in Table 20.

TABLE 20

PART PLAYED BY SCHOLASTIC RECORD IN GAINING EMPLOYMENT

DEGREE	REPONSES	PER CENT OF TOTAL RESPONSES
None	33	37.9
Very little	19	21.8
Some	21	24.1
Very much	11	12.6
No answer	3	3.4
TOTAL RESPONSES	87	

Thirty-three persons, or 38%, of the graduates indicated their scholastic record played no part in obtaining employment, while 19 persons, nearly 22%, indicated that their scholastic record played a "very little" part in their employment. Twenty-one persons (24%) of the graduates indicated their scholastic record played "some" part in their employment, while 11 persons (12.6%) indicated the scholastic record influenced their employment "very much". Nearly 60% of the graduates indicated the scholastic record played "very little" or no part in their employment.

The facts presented here appear rather startling, possibly due to the great emphasis placed upon grades at the college. It appears to the writer that the advancement of graduates of the industrial administration curriculum is more likely to be based upon individual characteristics than upon scholastic rating. Graduates of this curriculum, at least in the early years and to a considerable extent even to the present, are employed upon the basis of personal application to smaller industries in which employees are recruited largely as skilled or semi-skilled labor rather than through placement interviews conducted at the colleges. Under those conditions, there is apparently little stress upon scholastic accomplishment, although graduates of the curriculum do appear to have progressed more rapidly than non-college men, and somewhat in proportion to their abilities as indicated by college marks.

Additional education

It should be stated that Oregon State College does not offer graduate work in Industrial Administration, as such. Only one of the graduates indicated he held an advanced degree. That person holds a master's degree and is employed in the teaching profession. Only 14 of the graduates have taken additional college training since obtaining their bachelor's degrees. Thirty-one indicated they have had additional training but not on a college level. Most of these courses were in company schools or specialized schools in the military service.

TABLE 21

ADDITIONAL EDUCATION RECEIVED BY THE GRADUATES

TRAINING	NUMBER WITH TRAINING	PER CENT OF ALL RESPONDING GRADUATES
College level	14	16.1
Non-college level	31	35.6
Advanced degrees	1	1.1

As will be noted in Table 21, 16% of all the responding graduates have had additional college-level training, while 35.6% have had additional training but on a non-college level. From these facts it might be assumed that one-third of the future graduates will be sent to specialized schools where they are employed.

Courses most beneficial to the graduates

The graduates were asked to list the courses which have proved most beneficial to them. Many of the responses were in very generalized terms such as "all I.E. courses", "all metal courses", or "all shop courses". Only the specific courses were considered by the writer, with the results listed in Table 22.

TABLE 22

COURSES MOST BENEFICIAL TO THE GRADUATES

COURSE	NUMBER OF TIMES MENTIONED	COURSE	NUMBER OF TIMES MENTIONED
Accounting	22	Introduction to scientific management	2
Engineering drawing	22	Surveying	2
Machine shop	20	Industrial metallurgy	2
Methods and motion study	20	Accounting for technical students	2
Mathematics	19	Building construction	2
Business law	13	Foundry	1
Business English	12	Cost estimating	1
Speech	11	Advertising	1
Physics	8	Photography	1
Architectural drawing	8	Technical report writing	1
Psychology	7	Construction drawing	1
English	7	Engineering chemistry	1
Materials of engineering	7	Sociology	1
Production planning and control	7	Human relations in industry	1
Industrial supervision	6	Machine woodwork	1
Tool engineering	6	Salesmanship	1
Engineering problems	5	Patternmaking	1
Economics	5	Industrial safety	1
Mechanism	5	Cost analysis	1
Die design	4	Personnel management	1
Cost accounting	3	Automobile mechanics	1
Strength of materials	3	Job analysis	1
Welding	3		
Machine design	3		

Accounting and engineering drawing have proved most beneficial to the graduates as each was mentioned by 22 different graduates. One-fourth of the graduates reported they thought these two courses most beneficial, while

machine shop, mathematics, and methods and motion study were considered beneficial by 20%. Twelve per cent or more of the graduates considered business law, business English, and speech as beneficial. The remainder of the courses were listed by from one to eight persons but were not considered significant in view of the percentages involved.

Courses least beneficial to the graduates

To the question concerning courses that have proved least beneficial, as in the preceeding question, only specific courses were considered. The results are shown in Table 23.

TABLE 23

COURSES LEAST BENEFICIAL TO THE GRADUATES

COURSE	TIMES MENTIONED	COURSE	TIMES MENTIONED
Economics	13	Materials of engineering	2
Chemistry	8	Metallurgy	2
Accounting	7	Production planning and control	2
Methods and motion study	7	Engineering drawing	2
Statistics	7	Freehand drawing	2
Business law	6	Physics	1
Money and banking	4	Mechanism	1
Psychology	4	Income tax procedures	1
Patternmaking	3	Welding	1
Materials testing lab	3	Forging	1
Safety	3	Hygiene	1
Die design	3	Machine shop	1
Labor relations	3	Industrial electricity	1
Speech	3	Journalism	1
Sheet metal	3	Finance	1
Mathematics	3	Physical education	1
History	3	Business English	1
Supervision principles	2	Spanish	1
Introduction to scientific management	2	Fibre furniture weaving	1
		Art metal craft	1
		Oregon history	1
		Methods of study	1

Fewer courses were listed here in comparison to the number listed as the most beneficial. Perhaps the only significant listing, numbers considered, was economics, which was mentioned by 15% of the graduates. The remainder of the courses were mentioned by such a small percentage that further elaboration seems unnecessary. It appears to the writer that many of the courses listed are the result of personal dissatisfaction with the course rather than the extent to which the knowledge had been useful.

Suggestions for the addition of managerial-type courses

The graduates were asked to recommend managerial-type courses to be added to the curriculum.

Some responses indicated that additional emphasis should be placed upon certain courses. It may be assumed, then, that the courses listed in Table 24 represent either courses individually needed or that more emphasis should be placed upon them in the curriculum.

TABLE 24

SUGGESTIONS FOR THE ADDITION OF MANAGERIAL-TYPE COURSES TO THE CURRICULUM

COURSE	NUMBER OF TIMES MENTIONED
Personnel management	12
Sales courses	8
Tax courses	6
Labor union relations and laws	6
General business management, organization, and procedures	5
Psychology applied to management	4
Speech	4
Supervisory and leadership training	3
Report and manual writing	2
Cost estimating methods	2
Accounting	2
General office management and procedures	2
Human relationships in business	2
Job analysis	1
Material handling	1
Business law	1
English	1
Observation of industry	1
Budget procedures	1
Industrial purchasing	1
Advertising	1
Insurance	1
Production control for job shops	1

Twelve of the graduates indicated more stress should be placed on personnel management, while eight indicated that sales courses are needed, and six indicated more stress should be placed on tax procedures. Six specified a course in labor union relations and laws. A careful examination of these results, plus minor changes in the curriculum could take care of most of the suggestions, although electives have always provided sufficient personal latitude to accommodate such courses as the individual may wish. Some contacts with each of these areas except salesmanship and taxation are already provided for in the basic requirements.

Suggestions for the addition of technical-type courses

In question "12", the graduates were asked to recommend technical-type courses that should be added to the curriculum. Most of the suggestions were specific phases to be emphasized and actually reflected the problems of the graduates.

Six persons indicated that more machine design is needed and four graduates recommended the addition of elementary shop electricity to the curriculum. Two graduates listed production manufacturing, building construction on an industrial level, strength of materials, and engineering problems.

One person suggested the possibility of using "on-the-job training" as a phase of the curriculum. This is in line

with the suggestion that more field trips to industry are needed. Another graduate suggested seminars in the respective options while one suggested a course in research methods. An additional graduate recommended that a course in shop problems and procedures, taught by a tradesman, should be added.

The remainder of the suggestions, each mentioned by one person, is listed below.

1. Wood products laboratory
2. Machine capabilities
3. Study of industrial woodworking machinery
4. Production woodworking
5. Metallurgy
6. Materials handling methods and equipment
7. Statics
8. Dynamics
9. Suitability of metals for various jobs
10. Statistical analysis
11. Mechanics
12. Machine set-up time calculation
13. Cost estimating
14. Blueprint reading
15. Ceramics technology
16. Industrial instruments and controls
17. Processing and estimating
18. Plant layout
19. Materials testing
20. Industrial plant structural design
21. Shop routine and flow of work
22. Photography for technical people
23. Design and operation of heavy-duty equipment
24. Welding and fabrication
25. General forming of metals

CHAPTER III

SUMMARY AND RECOMMENDATIONS

The industrial administration curriculum has grown with increased rapidity since World War II, as evidenced by Figure 1.

Graduates of the curriculum have held many varied positions during the first three years of their employment. The leading positions are "engineers" of various types, "tradesmen", "production control workers", and "managerial positions". At the present time, the largest numbers of graduates are employed in four categories: 1) sales, 2) engineering, 3) managerial, and 4) self-employed. A slight upward trend is noted in the group graduating in 1947 or previous years toward becoming self-employed.

Half of the responding graduates indicated they have held their present jobs for less than one year. Less than 8% of the graduates have been in their present positions over five years.

Forty per cent of the graduates are currently employed by firms that hire less than 100 persons. One-fourth of the graduates work for firms employing less than 15 persons and one-fourth work for firms employing over 500 persons. The fact that 40% of the graduates work for firms of 100 or fewer employees indicates to the writer that the present curriculum should be modified to incorporate more of the

problems of firms of this size.

Manufacturing industries seem to be the chief employers of the graduates. Over 40% of the graduates are currently employed by firms engaged in some sort of manufacturing.

Only 10% of the graduates indicated that they were self-employed during the first three years following graduation. This fact indicates to the writer that there is little need for courses designed to be helpful in setting up small businesses.

Sixty per cent of the graduates obtained their first jobs through direct contact with their employers. Only 10% received positions as a result of interviews at college. It appears to the writer that a possible factor underlying this situation is the fact that industry does not know the qualifications of this group. Possibly better public relations plus a definite placement bureau for these graduates would alleviate the condition.

Over half of the graduates received between 3000 and 4000 dollars per year during the first three years of employment. Eight per cent of the graduates currently receive over 7000 dollars per year. The largest percentage (46%), however, still receive between 3000 and 4000 dollars per year. Those graduating prior to 1948 receive higher salaries in general than do the other graduates, as would be expected because of experience and progress. Seventy per cent of the 1950 graduates responding received between 3000

and 4000 dollars during their first year of employment. It may then be assumed that the average starting salary for graduates of this curriculum is currently between 3000 and 4000 dollars.

Nearly 50% of the graduates have worked for only one firm since leaving college. Nearly 90% of the graduates have worked for three or less firms. It may be assumed from this fact that the graduates of the curriculum generally find steady employment in industry, or have not been out long enough to give a true representation.

Over 50% of the graduates are very well satisfied with their choice of occupation. An additional 36% are satisfied but not to the fullest extent. A great many variants might be indicated by the responses. Perhaps those not fully satisfied are in the process of advancing and will become "very well satisfied" at the conclusion of their advancement.

Seventy-seven per cent of the graduates chose the industrial administration curriculum during the first two years at college while only 1% of the graduates chose the curriculum while in high school or before first enrolling in another college program. It seems to the writer that the high school contact committee should make more use of this curriculum in advising students interested in a technical career but without the many varied qualifications required in actual engineering programs.

Over 60% of the graduates indicated they chose the industrial administration curriculum because they were interested in industrial management but not from an engineering standpoint. Very few are attracted to the field by the pay received. This is in accordance with the salaries found in the study which are not considered high when compared to some other fields.

Slightly over 60% of the graduates were satisfied with the advice or counsel given them at college. However, 23% were not satisfied. Some forty suggestions were given to improve the advisory service. It appears to the writer that the advisors need to use a more personal approach in dealing with the problems of the students. It is also apparent that some method should be devised to present material to the students relative to positions open, types of firms employing graduates of the various options, and modern trends and developments in industry in general.

About 38% of the graduates indicated their scholastic record had no effect upon their employment, while an additional 22% indicated their scholastic record had very little effect upon their employment. Only one-third of the graduates indicated their scholastic records played a part, from "some" to "very much", in their employment. It appears from these facts that less emphasis should be placed upon "grades" at the college and more emphasis upon personal characteristics.

Over one-third of the graduates have received additional education since leaving college, mostly on the non-college level. This indicates that many firms send their employees through orientation schools within the firm. The fact that 16% of the graduates have had additional college-level education since graduation leads the writer to believe that graduate programs should be made available at Oregon State College in this curriculum. This of course should be done only after further exhaustive investigation of the needs of these graduates and the profit to be derived from advanced work.

Accounting and engineering drawing are courses considered most beneficial by 25% of the graduates after leaving college. Machine shop, mathematics, and methods and motion study are considered most beneficial by 20% of the graduates. These facts, as well as the remaining suggestions, should be called to the attention of future students and possibly considered in their program planning.

The courses considered least beneficial by the graduates are indicated by such small percentages as to be deemed unworthy of further elaboration. In general, the graduates have derived value from all courses in the curriculum.

Personnel management, sales courses, tax courses, and labor union relations and laws are thought by the graduates to deserve more emphasis. Advisors should again utilize

these facts in the planning of student programs as they no doubt reflect shortcomings in the graduates' programs.

Very little agreement was indicated in the recommendations for addition of technical-type courses. Machine design and shop electricity were perhaps the most significant of those mentioned.

Recommendations

It is recommended that the present curriculum be evaluated and, if necessary, modified to place more emphasis upon problems, methods, etc. of firms employing 100 or less persons.

It is recommended that a public relations campaign be carried out in the state to familiarize industrial employers with the qualifications of Industrial Administration graduates.

It is recommended that the placement bureau be encouraged and enlarged to further meet the needs of the graduates of this curriculum.

It is recommended that the advisory service be thoroughly evaluated and that advisors incorporate a definite plan in their services to the students, in view of the facts found in this study.

It is recommended that the department make further studies of the benefits to be derived from a graduate program in Industrial Administration at Oregon State

College.

It is recommended that the high school contact committee distinguish between industrial administration and the traditional engineering programs in advising students not wanting or able to follow the regular engineering curriculums.

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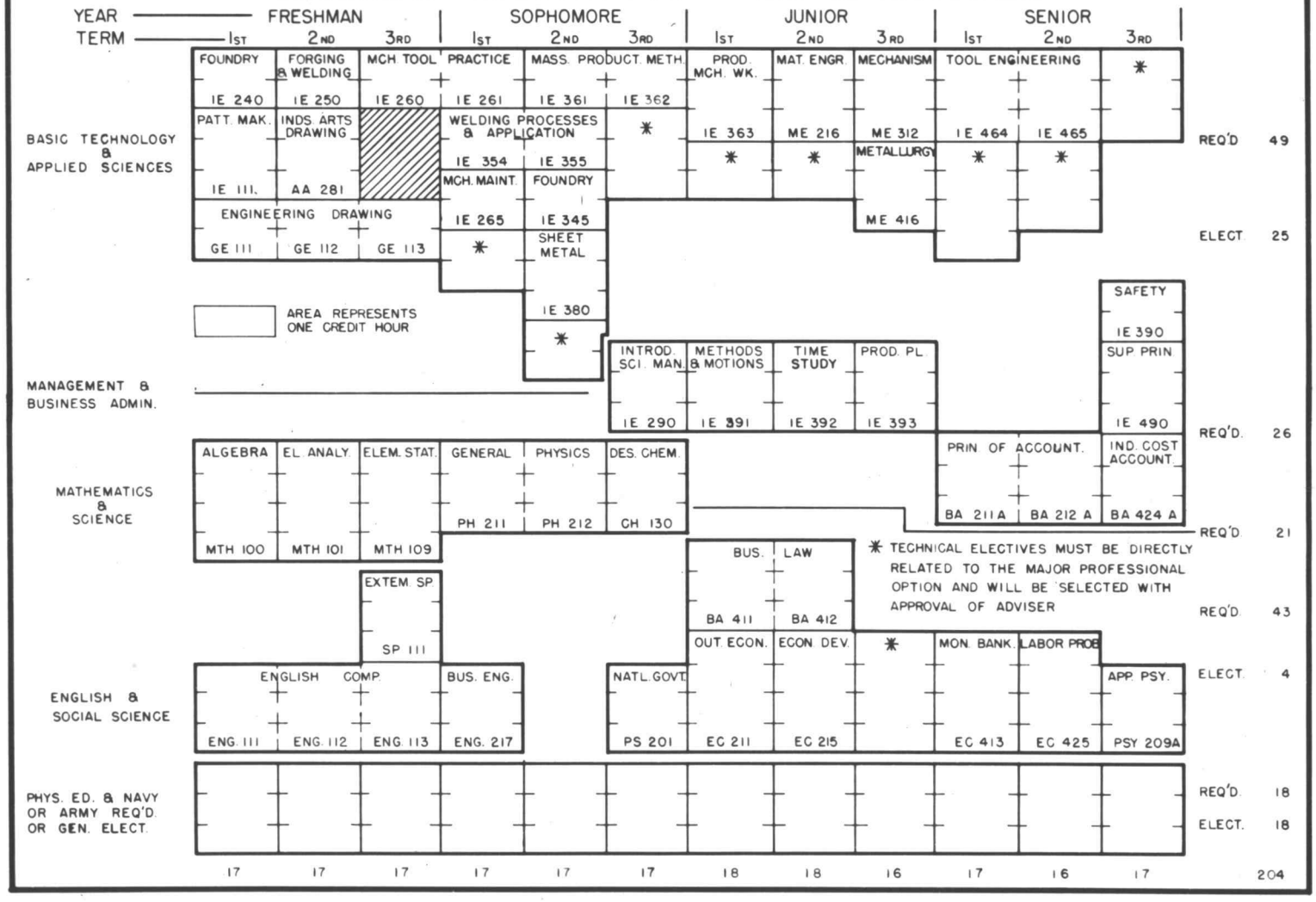
APPENDICES

APPENDIX A

Phases of the Industrial Administration Curriculum

NAME _____ OBJECTIVE _____ ADVISER _____

INDUSTRIAL ADMINISTRATION — METALS INDUSTRIES



NAME _____ OBJECTIVE _____ ADVISER _____

INDUSTRIAL ADMINISTRATION — WOOD INDUSTRIES

YEAR / TERM	FRESHMAN 1st	FRESHMAN 2nd	FRESHMAN 3rd	SOPHOMORE 1st	SOPHOMORE 2nd	SOPHOMORE 3rd	JUNIOR 1st	JUNIOR 2nd	JUNIOR 3rd	SENIOR 1st	SENIOR 2nd	SENIOR 3rd	
BASIC TECHNOLOGY & APPLIED SCIENCES	PATT. MAK. IE 111	METHOD WOODWORK IE 112	IE 113	MCH. MAINT. IE 225	*	*	MILL WK. IE 311	BLDG. CON. IE 333	WOOD & MET. FINISHING IE 316	*	*	*	REQD. 47
	FOUNDRY IE 240	FORGING & WELDING IE 250	MCH. TOOL PRACTICE IE 260	WELDING IE 354	IND. ARTS DRAWING			*					ELECT. 27
	ENGINEERING DRAWING GE 111	GE 112	GE 113	ARCH. DR. AA 178	ARCH. DR. AA 281 / AA 179	ARCH. DR. AA 180			*	*	*		
MANAGEMENT & BUSINESS ADMIN.							INTRO. S.M. IE 290	METHODS & MOTION IE 391	TIME STUDY IE 392	PROD. PL. IE 393		SAFETY IE 390 / SUP. PRIN. IE 490	REQD. 26
										PRIN. OF ACCOUNT. BA 211A	BA 212A	INDUS. COST ACC. BA 424A	
MATHEMATICS & SCIENCE	ALGEBRA MTH 100	EL. ANALY. MTH 101	ELEM. STAT. MTH 109	GENERAL PH 211	PHYSICS PH 212	DES. CHEM CH 130							REQD. 21
							BUS. LAW BA 411A / BA 412A						
ENGLISH & SOCIAL SCIENCE	ENGLISH COMP. ENG 111	ENG 112	ENG 113	BUS. ENG. ENG 217	EXTEMP. SP. SP 111	NAT. GOVT. PS 201	OUT. ECON. EC 211	ECON. DEV. EC 215	*	MON. BANK. EC 413	LABOR PROBLEMS EC 425	APPLIED PSYCH. PSY 209A	REQD. 43 / ELECT. 4
PHYSICAL ED.	REQUIRED PHYSICAL EDUCATION												REQD. 18
ARMY OR NAVY R.O.T.C.	REQUIRED MILITARY OR NAVAL SCIENCE												ELECT. 18
GENERAL ELECTIVES							* *					* *	
TERM CREDITS	17	17	17	16	17	17	16	18	17	17	17	17	204

GENERAL ELECTIVES

AREA REPRESENTS ONE CREDIT HOUR

* SEE REVERSE SIDE FOR SUGGESTED TECHNICAL ELECTIVES, WHICH MUST CONTRIBUTE TO THE OBJECTIVE AND BE APPROVED BY THE MAJOR ADVISER.

** GENERAL ELECTIVES, OR ADVANCED MILITARY OR NAVAL SC.

ELECTIVES APPROPRIATE FOR:

1. BUILDING CONSTRUCTION MAJORS

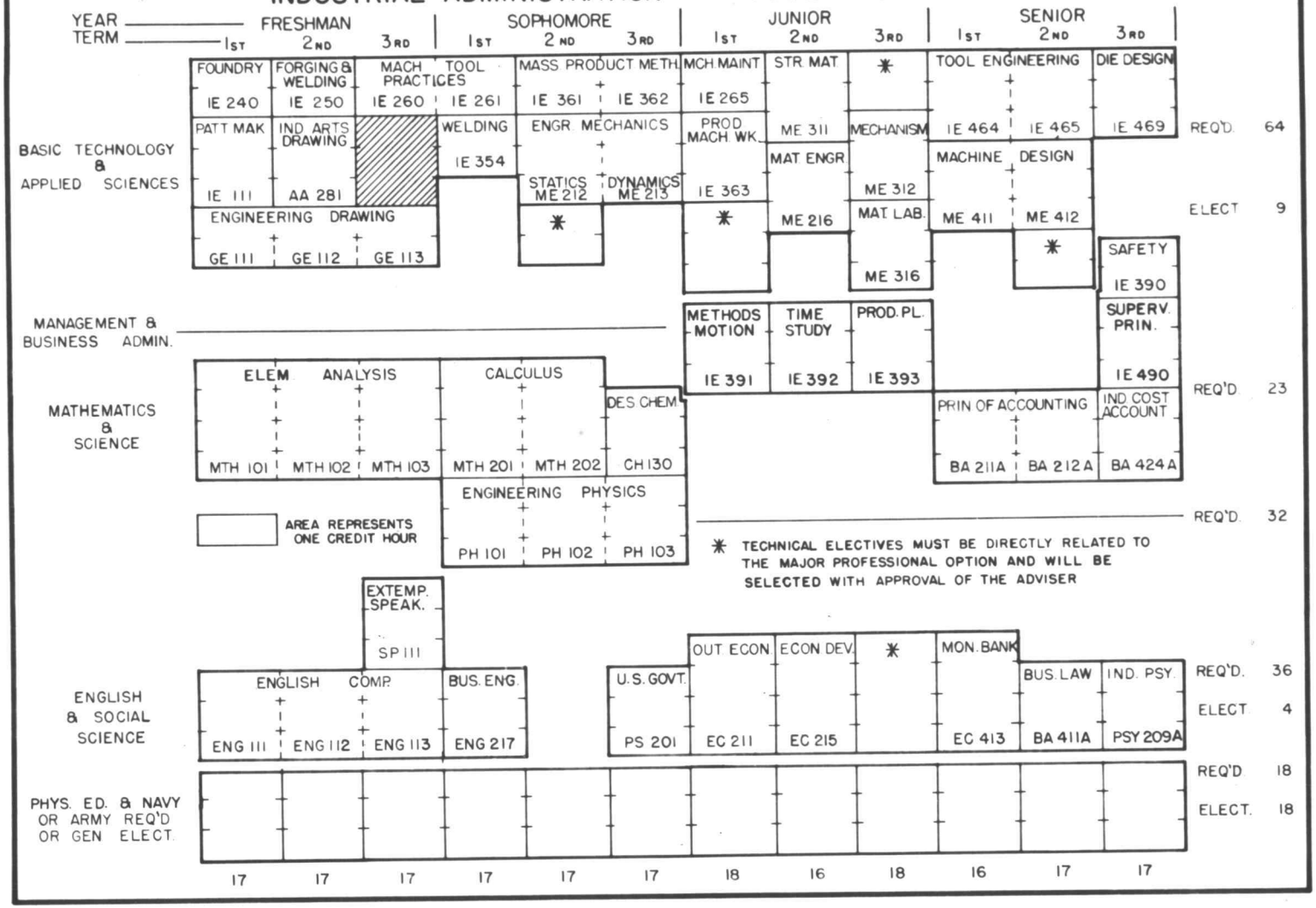
WOOD IDENTIFICATION	FP 311A
CONSTRUCTION DRAWING	AA 220, 221, 222
INDUSTRIAL ARTS DESIGN	AA 282
ARCHITECTURAL DESIGN	AA 297
ARCHITECTURAL COST ESTIMATES	AE 405
PLANE SURVEYING	CE 226
HOME-GROUND PLANNING	LA 279
LANDSCAPE DESIGN	LA 290
SHEET METAL WORK	IE 380
ORNAMENTAL IRON WORK	IE 353
CONTRACTS & SPECIFICATIONS	CE 427

2. FURNITURE AND MILL-CABINET MAJORS

INDUSTRIAL ARTS DESIGN	AA 282
FURNITURE DESIGN	IE 213
WOOD TURNING	IE 220, 321
FURNITURE CONSTRUCTION	IE 313, 314
UPHOLSTERING & SEAT WEAVING	IE 315
ORNAMENTAL IRON WORK	IE 353
INDIVIDUAL PROJECTS	IE 405
WOOD IDENTIFICATION	FP 311A

NAME _____ OBJECTIVE _____ ADVISER _____

INDUSTRIAL ADMINISTRATION — TOOL DESIGN OPTION



APPENDIX B

A copy of the Questionnaire
used in the study

A FOLLOW-UP STUDY OF OREGON STATE COLLEGE GRADUATES

IN INDUSTRIAL ADMINISTRATION

Name _____ Address _____

Year of graduation _____ Option _____

1. Please indicate the approximate time at which you chose to enter the industrial administration curriculum.

   __During high school __First two years of college

   __During work experience after high school __Second two years of college

2. Indicate why you chose the industrial administration curriculum.

   _____ Position offered, dependent upon college training

   _____ Pay offered in the field

   _____ Interested in industrial management but not from an engineering standpoint

   _____ Other: _____

3. DURING THE FIRST THREE YEARS OF EMPLOYMENT AFTER GRADUATION:

   a) What type of position did you hold? _____

   _____

   b) What firm(s) did you work for? _____

   _____

   c) Approximately how many people were employed by the largest firm for which you worked? _____

   d) What was your highest salary during that period?

   _____

   e) Or, were you self-employed? _____YES _____NO

f) Please indicate how your first job was obtained.

_____ Interview at college

_____ Employment agency

_____ Contact through friend or relative

_____ Direct contact

4. a) What is your present position? _____

b) How long have you held this position? _____

c) What type of business does your firm do? _____

_____

d) Approximately how many people are employed by this firm? _____

e) Please indicate how this job was obtained.

_____ Contact through friend or relative

_____ Employment agency

_____ Direct contact

_____ Other: _____

f) How many firms have you worked for since graduation?

_____

g) Please indicate your present annual salary group.

_____ Less than 1500

_____ 1500 to 2000

_____ 2000 to 3000

_____ 3000 to 4000

_____ 4000 to 5000

_____ 5000 to 6000

_____ 6000 to 7000

_____ Over 7000

5. Please indicate the degree to which you are satisfied with your choice of occupation.

_____ Very well satisfied

_____ Satisfied

_____ Unsatisfied

_____ Very unsatisfied

6. List the college courses which have proved most beneficial to you.

_____ _____

_____ _____

7. Which courses in your college program have proved least beneficial?

_____ _____

_____ _____

8. Did the advice or counsel given by your college advisors prove satisfactory? _____YES _____NO

Please give suggestions for improving the advisory service.

_____

_____

9. What additional college work have you taken since receiving your bachelor's degree? _____

_____

Advanced Degrees: _____

What additional educational training, not of college level, have you had?

_____

10. What part has your scholastic record played in your employment?

_____ None _____ Some

_____ Very little _____ Very much

11. What managerial-type courses would you recommend be added to the curriculum?

_____

_____

12. What technical-type courses would you recommend be added?

_____

APPENDIX C

A copy of the
Letter of Transmittal

OREGON STATE COLLEGE
School of Engineering and Industrial Arts
Corvallis, Oregon

March 10, 1951

Oregon State College Graduates
Industrial Administration Curriculum
1930 to 1950

Dear Fellow Student:

Oregon State College has offered the bachelor's degree in Industrial Administration since 1930. The industrial arts department is interested in obtaining information about the graduates of this curriculum.

The survey will enable the department to better meet the needs of future students. Your answers and opinions will play a very important part in this undertaking.

It will be greatly appreciated if you will fill out the enclosed questionnaire. Please feel free to make any additional comments on the back of the questionnaire. A self-addressed, stamped envelope is enclosed for your convenience.

You may be assured that the information given will be held in strict confidence. The compilation of facts, resulting from this questionnaire, will in no way identify you or your position.

May we express our wholehearted appreciation for your aid and cooperation in this matter.

Very truly yours,

Coordinator

Approved by: G. B. Cox
Encl: Questionnaire

APPENDIX D

A copy of the
Follow-up Letter

OREGON STATE COLLEGE
School of Engineering and Industrial Arts
Corvallis, Oregon

April 2, 1951

Oregon State College Graduates
Industrial Administration Curriculum
1930 to 1950

Dear Sir:

A short time ago we sent questionnaires to all graduates of the industrial administration curriculum to obtain information for the department.

Our returns have been good. However, we need responses from more graduates if our survey is to be inclusive.

WILL YOU HELP US OUT?

Another copy of the questionnaire is included in case you have misplaced the former one. A self-addressed, stamped envelope is included for your convenience.

Please help us out by sending in your response immediately.

May we again express our appreciation for your assistance in this matter.

Very truly yours,

Coordinator

Approved by: G. B. Cox
Encl: Questionnaire

APPENDIX E

A copy of the unpublished speech
presented by Professor George B. Cox to the
Engineering Division,
Conference of the Land-Grant College Association,
Washington, D. C.
on November 13, 1950.

A FOUR-YEAR TECHNICAL CURRICULUM FOR NON-PROFESSIONAL ENGINEERING PERSONNEL*

George B. Cox
Head, Industrial Engineering
Oregon State College

That the Engineering section of the Land-Grant College Association is interested in "technical curriculum patterns" and the "technical institute" sufficiently for a discussion of "Our Responsibility as Land-Grant Institutions to Provide Technical Non-Professional Programs", is a tacit admission of the need to serve those who enroll in engineering but who, for one reason or another, do not complete the traditional undergraduate engineering program. While the recognized engineering schools and the Engineering Council for Professional Development are in close agreement on the earmarks of the "professional" program, there is no general agreement on a pattern of training for those who wish a college degree closely related to engineering but who cannot or will not conform to requirements of the traditional program.

Since the beginning of discussions about "The Technical Institute" (usually on a 2-year level), such words as "engineering aids" and "Junior Engineers" have become familiar terminology. Is there any fundamental reason why such a program must terminate with the first two years of college training? Why not a 4-year technical program worthy in every respect to the dignity of a college degree? In an engineering school, such a program should have a distinctive pattern of training related to engineering. The purpose should be to form a team of professional and technical personnel, some with distinctly professional training, others with a technical background of vastly greater service in the production and/or management fields than is possible with the present wide gaps between labor and management on the one hand, and between management and engineering personnel on the other. Even in the present industrial engineering programs there is a wide gap -- nearly a gulf -- between engineering and labor. That gap can be bridged.

*A paper prepared for presentation at the November 13, 1950 conference of the Land-Grant College Association, Engineering Division, Washington, D. C.

Factors Contributing to the Need for a Technical Non-Professional-Engineering Program

In my grandfather's generation a high school education was reserved for the few -- notably for those entering colleges for medical, legal or liberal arts courses. A grade-school graduate was considered to be "well equipped for life", except in the medical profession and law.

In my father's generation high school graduates were still uncommon, but the college graduate had taken on somewhat greater importance. Then, college entrance was based exclusively upon a college-preparatory program with mathematics and language requirements. Today, few people enter employment without the benefit of a high school diploma; but very few of these have completed the type of program formerly required of high school graduates. Perhaps this situation has a bearing upon the need for a college technical program related to the professional engineering curriculum. In 1950, more students entered colleges without algebra than entered colleges in total in the year 1900. It is inevitable that many of those without high school mathematics adequate for the traditional engineering program, but with a desire to earn a livelihood in some technical field related to engineering, will enroll in or apply for admission to an engineering school.

When the number of drop-outs and "misfits" in engineering schools exceed the number completing requirements for graduation, faculties and administrative officers are concerned. It is not a healthy condition when the number of disappointed customers exceeds the number of satisfied customers.

The misguided concept of the engineer as the fellow "who designs and builds bridges, machines, automobiles, airplanes, and other devices", without the realization that this can be true only after he has first mastered the use of mathematics and science as tools of design and construction, is one factor contributing greatly to this problem. The alarming fact is that the number of people entering schools of engineering with this misguided concept, and totally lacking in an adequate background of high school mathematics, is increasing with each passing year. The popular concept of the work and service of the engineer is glamorized by high school students, but the necessity for a mathematics background and for the applications of mathematics and science in the work of the engineer seldom gets across! Guidance counselors have been alert to the romance of engineering, aware of the interest boys have in industry and manufacturing, and quite sure that a larger and larger

percentage of the population must find employment in industry or engineering and related technical applications. World War II, with its listing of "critical personnel" and the almost immediate repetition of those same critical categories in the present period of national tension, has emphasized the desirability of and the need for technical training -- without, at the same time, changing the attitude of the high schools toward the need for mathematics and related foundational courses.

It was out of a background of experience and reasoning along these lines that Oregon State College introduced a 4-year technical curriculum leading to the degree of Bachelor of Science in Industrial Administration. While we have used the term "Industrial Administration" for the past 22 years, we are not sure it is the ideal term for the program. Be that as it may, the curricular pattern of the program, its objectives, and the services derived from it by the graduates, are factors of greater importance for this report.

It is our observation, based upon a study of several hundred cases and personal interviews with nearly as many students, that those who fail within the first two years of an engineering program (in spite of definite interests in engineering procedures and applications) do so largely because of deficiencies in or antipathies toward the abstractions of higher mathematics and the basic sciences. The deficiencies in or antipathies to the sciences are often based upon deficiencies in mathematics. This is especially notable in physics. One earmark of the technical, non-professional curriculum would therefore seem to be a mathematics sequence of lower order than is found in the undergraduate professional-engineering program. Mathematics should be required in such a program, but there is no more reason that every engineering aid or technical collaborator must have calculus than there is that every modern-day high school graduate should complete two years of algebra. Nor is stigma to be attached to a college degree awarded for work in a technical field without the benefit of calculus, any more than to a high school diploma without the benefit of algebra. It is essential only that the program be distinctly at the college level, and that it embrace a coordinated and purposeful selection of courses the mastery of which will give reasonable assurance of training in 1) self-discipline, 2) useful subject-matter and 3) desirable and effective personal traits. All of these should be of value to the individual, to the industry or profession he serves, and to the state or society in which he lives. These services should be rendered in a measure comparable

to the services performed by other curricular programs for other college graduates.

Distinguishing Earmarks of the Curriculum

If one earmark of the 4-year technical non-professional engineering program is a lower order of mathematics, another earmark of the program should be enriched instruction and experiences in areas closely related to the work of the professional engineer but in services which are frequently minimized in or excluded from the undergraduate training of a professional engineer in deference to specialized applications of science and mathematics essential to the designing engineer. In particular, one area for enrichment in the technical non-professional program lies in the field of manufacturing operations and processes, included to a much greater degree in all undergraduate engineering programs prior to the time of diversification at the freshman level and increasing "specialization" at the sophomore and upper-division levels.

Here then are two earmarks of the technical program related to engineering. They are:

1. Less mathematics than in the undergraduate professional program.

2. More opportunity for functional instruction and practical experience with the basic tools, machines, and processes essential alike to engineers and to industrial concerns which manufacture most of the products designed by engineers.

If the 4-year program for the young professional engineer will not permit him to know well the problems of the shop -- from workman and skilled artisan to the foreman and the production manager, including both the terminology of the shop and the realistic, practical solution of problems centered about turbulence in molds, risering and gating of castings for proper effect on shrinkage and crystalline structure, effective operation schedules on typical machines, and the interdependence of design, shop production, methods, and materials -- if these are denied the professional engineer (except as he may learn them by post-graduate experience at considerable expense to his employer and dissatisfaction to himself), then they should be given to his technical aid and curricular cousin. There is neither disgrace nor lost time in working with one's hands. The real effect is to give integration, assimilation and fixation to any learning which is important, and

which is not readily gained without trial and error. The story of "They Called Him El Loco", page 149, November 1950 Readers Digest, carries the message of an engineer who had learned the value of work with his hands.

If these two characteristics -- less mathematics and more work with basic machines, tools, processes -- were the only distinguishing features of the 4-year technical program, your comment would rightfully be -- "Oh, a college degree for vocational training!" But a third earmark of the 4-year non-professional engineering program is specific training in the field of management. At Oregon State, the management sequence is a combination of basic courses in economics and business administration (including accounting, business law, finance, labor problems), plus a core of applied scientific management courses conducted by the industrial engineering faculty. These latter courses include the elements of scientific management -- methods and motion study, production planning, principles of industrial supervision.

It is this third earmark, coupled with a definite opportunity for enriched experiences in the functional applications of manufacturing processes and operations, all taught by a staff especially selected for competence in and devotion to the objectives of the program, that gives both breadth and depth -- which really is "stature" -- to a technical program at the college level. Both the staff and the facilities must be more adequate than those normally used for "engineering shop courses". Otherwise it might be justifiably referred to as a "vocational" program.

The Curricular Pattern of a 4-Year Non-Professional Engineering Program

The foregoing remarks have been addressed to generalities, with only a sufficient reference to specific items to give form to the generalities. The problem now is to make the application more specific and at the same time point to several avenues along which the 4-year non-professional program may travel. An "avenue", as used in this presentation, is synonymous with a well-defined field of application. In some regions, one avenue for the technical curriculum could well be textiles. In another, it might be ceramics. At Oregon State College the non-professional-engineering program has developed along three distinct avenues, centered about industries or industrial applications important in our geographic location and possible with our facilities. These avenues are expressed in terms of "options". There is only one curricular program -- which leads to the degree, Bachelor of Science in Industrial Administration -- but the

curricular pattern provides for three distinct options and two sub-divisions of the third option. These are:

1. The metals-industries option
2. The tool-design option
3. The wood-industries option
    a. Building construction
    b. Furniture or mill-cabinet construction

You may infer that Oregon State College has developed the wood-industries option rather extensively. That is natural because the college is located in the largest remaining timber-producing area of our country. Most of our homes and furniture are built of lumber and lumber products. This option is currently one of the popular avenues of training in the industrial administration curriculum. Graduates of the building construction option have done well. Several of them have entered the contracting business and all have prospered enormously during these past several years.

Some have advanced to "professional" stature -- or at least to full-fledged business stature -- entirely upon the basis of the training afforded by the 4-year technical curriculum. Three of these operate in our home town -- Corvallis -- having remained in the community after completing their degrees. This has afforded a first-hand opportunity to witness their development. Two of them are operating on a scale sufficiently large that they employ several crews of men on from 4 to 6 simultaneously operated construction projects -- homes and small business buildings. One operator, since graduation four years ago, has purchased and developed a considerable block of land in a new sub-division, providing plans and specifications for residences and constructing them in a manner designed to give his clients a modern home of quality at reasonable cost. His beginnings were modest but within the 4 years he has become one of the major young contractors of the community.

This pattern of development is explained in some detail because it is typical of the objectives of the curriculum for industrial administration. Neither the curriculum nor its graduates are limited to building construction merely because we are in the midst of a timber-producing, wooden-home-building area. A majority of the industrial administration students are enrolled in the metals-industries option, which is approximately twice as

popular as the wood-industries option. Several of the early graduates of the metals-industries option (the program was initiated in 1928) found employment with Boeing Aircraft and other aviation companies of the west. Boeing has consistently returned for additional graduates, because they have proven valuable as engineering aides, production assistants, procurement men, and supervisors of production.

Other graduates of the metals-industries option have served in the industrial engineering staff of the Aluminum Company of America in the casting, forging, extruding and fabricating plant at Los Angeles, and elsewhere. These men are all in supervisory or industrial engineering positions.

Like graduates of the wood-industries option, graduates of the industrial administration metals-option, frequently establish businesses of their own. Examples are three or more furnace and sheet metal works, one of which manufactures furnaces and all related parts, including the patterns, castings, welded steel shells, and sheet metal work. A 1940 graduate, after 4 years in the armed forces and one year as sales manager for a die-casting concern in Portland, now owns and operates a company which manufactures builders' hardware.

A sidelight on this particular case may be of interest. He launched his business about three years ago, when production was a major problem and selling was no problem at all. In June 1950, sales resistance had increased, resulting in an appeal for a graduate of the 1950 class capable of taking over the management of the manufacturing operations. With the dropping off of sales, the 1940 graduate and owner of the plant, already experienced as a sales manager, returned to an intensive sales development program.

These examples are cited -- and they could be multiplied extensively if time permitted -- as a means of illustrating the diversity, the breadth, and the stature of the curriculum for industrial administration -- a 4-year technical program designed specifically as a service to students well-qualified for college work, interested in engineering and engineering applications, but not well-qualified for nor interested in the abstractions of higher mathematics and science typical of the undergraduate program for professional engineering.

Accompanying this report are the curriculum diagrams for the several options. The tool design option, which more nearly approaches the undergraduate professional engineering curriculum (in mathematics and machine design requirements), enrolls the fewest students. That is natural because fewer

tool design opportunities are available in our geographic area. Tool design graduates have been employed by Boeing Aircraft and various other companies, in which they perform the functions of tooling engineers (so rated by the companies), and constitute an extremely valuable link between the highly skilled tool and die makers of the labor group and professional engineers in the design group. It is noteworthy also that a 1950 tool-design graduate placed third in the annual competitive awards of the James F. Lincoln Foundation. His paper was on "A Study of Arc Weld Fabrication of Turret Tools for Turret Lathes". His entry was topped by only two others -- one an architecture graduate of Rensselaer, on "A Comparison of Framing in Welded Steel and Aluminum"; the other, a mechanical engineering graduate of Iowa State University, on "Investigation of Some Practical Applications of Low Hydrogen Type Electrodes".

Not all of the graduates of the industrial administration program remain in the Pacific Northwest. Particularly those in the metals-industries group, and to some extent those in the wood-industries group, find opportunities and employment elsewhere. For example, one of the 1939 graduates of the metals-industries group has formed a partnership with his older brother, a 1938 graduate, to set up a business at Wasco, California embracing 4 major operations, as follows:

1. Building construction -- their original venture together.

2. A lumber yard serving both retail and wholesale trade, and incidentally supplying materials for their own operations.

3. A custom jobbing shop, including the engineering design, and fabrication of custom-made oil well equipment and supplies.

4. A land-leveling and earth-moving business.

These men employ engineering talent to supplement their own knowledge, skills and abilities. To manage and operate their retail-wholesale lumber business they employed (two years ago) one of the more recent industrial administration graduates, wood-industries option. Native ability may have accounted for a great deal of their enterprise, but both of these brothers have told us repeatedly of the impetus and the foundation given them by the training afforded in the industrial administration program. The senior member of this partnership, incidentally, is a "remade" public school teacher, whose initial training at

Oregon State College was in the curriculum for industrial arts education. That program has something in common with the industrial administration curriculum, although it does not include any of the courses in the scientific management or business administration groups.

Curriculum Diagrams

If you will analyze with me the curricular patterns involved in three of the diagrams attached, it will be interesting first to note a high degree of similarity between the options for the metals-industries group and the wood-industries group and to a lesser degree a similarity in the general subjects required for the tool design option.

Note first the column headings across the top, showing the four years of the program -- freshman, sophomore, junior, senior -- with the three sub-divisions of each representing the fall, winter, and spring terms. Oregon State College operates on the term or "quarter" basis.

Along the left margin of the curriculum diagram, note the major classifications of subject matter -- basic technology and applied sciences; management and business administration; mathematics and science; the English group and the social sciences (including economics, business law, etc.); and finally, the courses in physical education and army, navy, or air corps R.O.T.C.

In this lower bar of the diagram provision is made that the R.O.T.C. program may run through four years, leading to a commission. Those who elect to discontinue the R.O.T.C. program at the end of the sophomore year fill the junior and senior year areas with general electives.

Asterisks in the spaces bounded by the first horizontal bar of the diagram -- basic technology and applied sciences -- indicate technical electives which must be selected in terms of the major objective of the student and be approved by the major adviser.

In the curriculum for the wood-industries option there is a greater provision for electives than in either of the other options. On the back of the diagram for the wood-industries option, two groups of suggested electives are listed under headings corresponding with the two sub-options, for furniture and mill-cabinet majors and building construction majors. The one curricular pattern for the wood-industries option, with the two groups of appropriate electives and staff counsel on individual problems, suffices admirably for both groups. Each subject specifically named

on the front of any curriculum diagram is a specific requirement.

There is little question but that each specific subject presented, whether as a requirement or as an elective, could be challenged by a person so inclined. The subjects specified as requirements and those suggested as electives grow of several years of experience with the curriculum and many conferences with the students -- before and after graduation. Some requirements and electives have been modified from year to year, based upon experience, staff reaction, and suggestions from employers or graduates. There has been a gradual improvement and strengthening of the program since its inception in 1928. Twenty-two years of experience with this 4-year technical curriculum, specifically related to engineering and yet not classified as a professional engineering program, have led us to the conclusion that there is a place for such a program, that it is well received by students interested in engineering applications but not interested in or capable of normal progress with the subjects traditionally required in the professional undergraduate engineering program, and that, employment-wise, it has many possibilities. The work is proving up in industry and in business. It has been slow in receiving the acceptance of industrial and engineering personnel but experiences of the past five years indicate that time is on the side of the industrial administration program.

Selfishly, we hope not too many schools attempt this sort of a program. We can stand competition, but naturally prefer to have a wide open field. I have no doubt that it is possible to overdo the situation, like the prunes and the filberts of the Pacific Northwest. When early prune orchards began to pay handsomely, hundreds of farmers tore out apple orchards and gave up other farm crops to plant prune orchards. Some years later the prune market went to pieces. In the meantime a few pioneers had made filberts pay. Now there is a glut on the filbert market. To those of you who have gathered "hazelnuts" as barefoot boys, the filbert is a hazelnut which has grown up under the influence of higher education and up-breeding.

It is devoutly hoped that wherever the 4-year non-professional engineering program is tried, it may be given sufficient breadth and stature to justify a college degree; and that the facilities and the staff for the practical applications in manufacturing operations, processes, and "know-how" will be adequate to do the job well. Under any other conditions the program will fail -- fail the school concerned, the students involved, and the industries who try

the men. No college program can long endure if it is a "soft" program. Under proper auspices, with careful development of the subjects along well-defined avenues of training in which the graduates may find opportunities to use their own initiative or become working partners with their curricular cousins in engineering design and/or production, and with staff and facilities adequate to these needs, the program will serve both the students and the industries which employ them. It is our experience that they will also serve the profession of engineering as a most valuable medium standing squarely in the gap between the professional engineer on the one hand, and the labor-management groups on the other.

APPENDIX F

APPENDIX F

The following comments were received to question "8" and are grouped for easy comparison.

PERTAINING TO INDIVIDUALS

Show a greater interest in the individual.
Evaluate student objectives in more detail.
Give more personal advice, as well as more time for counseling.
Avoid advisors who are too self-centered.
Need closer personal contact.
Point out advisory service to freshmen so that they are aware of it.
Give advice earlier.
Don't base advice on grades received.
Provide more personal contact.
Have more personal interest in students.
Avoid present form of course selection and use true guidance in choosing careers.
Show more concern for students.
Use more personal approach.
Should try to meet student needs rather than try to fill his own classes.

PERTAINING TO TIME AND SCHEDULES

Provide more time for the advisors.
Have regularly scheduled conferences.
Require student-counselor meetings once a term.
See students only by appointment.
Keep strict adherence to schedules for interviews.
Have definite schedule of appointments -- more personal contact.
Don't have too many students per advisor.

PERTAINING TO EXPERIENCE AND INFORMATION

Provide advisors who have worked in the field every four years.
Secure more information as to fields open.
Need wider experience in allied fields.

OTHER PHASES

Avoid "too much railroading".
Provide better application of the college testing bureau.
Follow up advisory service.
Need more field trips.
Believe advisory service quite good.
Recommended change which was later beneficial.

The following items were suggested, all of which have been incorporated in the curriculum, either directly or indirectly, by recent modifications.

Place more emphasis upon problems in industry.
Scheduled talks at mid-term, before contemplated term's work.
Provide more information about firms employing specific majors.
Keep advisors in closer contact with industry.
Hold personal discussions on types of positions and what is required by hiring firms.
Obtain advisors with more practical experience.
Have more awareness of conditions in industry -- to help with job placement.
Suggest more electives to broaden the student's outlook.
Provide aptitude tests -- more definite goals.
Allow selection of advisor in field of interest.