

A DISCUSSION AND COMPARISON
OF THE CO-OPERATIVE AND
NON-CO-OPERATIVE ENGINEERING COLLEGE

THESIS FOR THE DEGREE OF M. E.

Russell Artie Ammon

1931

THESIS

A DISCUSSION AND COMPARISON OF THE
CO-OPERATIVE AND NON-CO-OPERATIVE
ENGINEERING COLLEGE

A THESIS SUBMITTED TO THE
FACULTY OF
MICHIGAN STATE COLLEGE
EAST LANSING, MICHIGAN

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JUNE 1931

THESIS

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CHAPTER I

The purpose of this thesis is to clarify certain points which have arisen in the minds of individuals interested in engineering education. A brief summary of the points discussed is given here.

After giving a brief history of both the non-co-operative and co-operative college, differences in the method of selecting students at Michigan State College, an example of the former, and the General Motors Institute of Technology, an example of the latter is shown. Next the difference in the relation between student and institution at the above mentioned colleges is shown. Following this, methods of handling students and the keeping of student records are compared and discussed. Next a comparison of the curricula and the method of handling various courses at these two institutions is made. Following this is a discussion of the effect on students of continuous and periodic training. A discussion of the fields of the co-operative and non-co-operative engineering colleges and a comparison of the products of each type of school follows. In a summary of the advantages and disadvantages of the co-operative type of education as published by the American Society for the Promotion of Engineering Education, the advantages and disadvantages to the student, faculty, and co-operating plant are given. Finally there is presented a work schedule designed for students working at one of the co-operating plants. This shows how a carefully thought-out work schedule aids materially in giving the student a well rounded engineering

education.

Although comparisons will be made between the co-operative and non-co-operative engineering colleges in general, the major portion of the comparisons will be between two colleges located comparatively near to each other, serving what one might practically term the same community. Although there are a number of students in each institution who are not from the given community, the majority of the students are. Most of the comparisons in this thesis will be between two well known colleges, Michigan State College and the General Motors Institute of Technology.

CHAPTER II

In considering the co-operative system of today there are several points which should be discussed. The present generation is now adapting itself to a new development of society. A number of years ago, the beginnings of the industrial revolution laid the foundations for a type of social order which in the main was new in human annals. This new order is essentially industrial, or taken in the broader sense, economic. We are today witnessing new developments, and the future significance of this transition is still beyond the possibility of accurate appraisal. Some of the major changes wrought during this period of growth, also changes that are still going on, have brought about great changes in the scope of the American educational system.

The rapid growth of population, for example, has necessitated an unforeseen expansion in public school facilities. Then, too, educational needs have been enlarged or modified by such changes as the greater urbanization of population, the rise of standards of living, the transformation of processes of production from hand methods to machine methods, the evolution of large scale industry and mass production, the breaking down of time and distance by new methods of rapid transportation and communication. All of these changes have contributed to the altering of human relationships and the corresponding adjustments in the American educational system.

School and industry are different aspects of a single society,

and the habit of mind which isolates them from each other is a habit which we must strive hard to overcome.

Education fails in part of its aim if it does not prepare students for a life of active labor and of social co-operation; industry fails no less if it does not strengthen the qualities of mind and character which have been cultivated by education.

If we consider the educative process broadly, we note that a variety of agencies contribute to it. Under ordinary circumstances, the child learns writing in the school, language in the home, religious ideas in the church, games on the playground, and practical skill in the workshop. The theatre, the newspaper, and the club also contribute to the student's stock of knowledge, but the knowledge obtained from these institutions is specialized.

In the primitive wilderness, the boy followed his father in hunting and fishing, and, in time, by process of imitation and suggestion, together with that learning which comes from trial and error, he became himself, a fairly efficient hunter or fisherman. By and by some of the arts became highly complex, and the process of transmitting them from father to son necessitated better organization. There then grew up in the ancient crafts the system of apprenticeship which is still used in some forms. This we may say is (although hundreds of years ago) where the co-operative plan had its roots. In the apprenticeship system they learned by doing. Then came the development of the public schools. In order to give a broader basic training for various vocations, colleges and universities were founded. Despite this fact, some of the larger industrial corporations of today feel the need of men with a different

and in some respects broader training than is furnished in the ordinary college or university. For this reason certain educational institutions have been established by some of the industrial corporations for specific training and actual co-operation in the various branches of the industry itself.

The first mention we find in history to what we might term co-operative education other than the apprenticeship systems is in 1774. At this time Pestalozzi, a successor of Rousseau, failed in an agricultural venture he had been working on. This failure afforded him an opportunity to experiment with philanthropic and industrial education. At this time he took into his home about twenty of the most needy children he could find. These he fed, clothed, and treated as his own. He gave the boys practical instruction in farming and gardening on small tracts, and had the girls trained in domestic duties and needle work. In bad weather both sexes gave their time to spinning and weaving cotton. They were trained not only in the rudiments of life but also were practiced in conversing and in memorizing the Bible before learning to read and write. The scholastic instruction was given very largely while they were working, and, although Pestalozzi had not as yet learned to make any direct connection between the occupational and the formal elements, this first attempt at industrial education made it evident that the two could be combined. Within a few months there was a striking improvement in the physique, minds, and morals of these children, as well as in the use of their hands. Pestalozzi became so enthusiastic over the success of his experiment, that he greatly increased the number of children to such an extent that by 1780 he was reduced to bankruptcy.

From this time until the present, the co-operative system has grown in several branches and stages of education.

The co-operative plan for college engineering education had its origin in this country when Dean Herman Schneider introduced it at the University of Cincinnati. At the time of its origin practical men were very severe in their criticism of graduates of engineering colleges, the old apprentice system had broken down under the strain of complex industrial organization, and it seemed that engineering colleges were making little effective effort to supply the link between theory and practice. Something seemed to be amiss, and many of the educators of the country were seriously considering the problem.

A solution to the problem dawned upon Dean Herman Schneider one evening as he was walking across the campus of an eastern university. As he watched the crimson glow of a near by blast furnace, it came to him that there was a college, the real college which could teach life, in the steel mills, in the machine shops, in the production plants, and in the offices of industry. Why not let both theory and practice be learned in a single progressive educational program, with industry supplying practical information while in the lecture rooms and class rooms might be imparted step by step the theories and cultural knowledge which should accompany it.

After Herman Schneider had worked out the details of his plan and had presented it to the faculty, they rejected it for too many held to the old cultural theory. Herman Schneider then talked it over with many practical men who indorsed it. In 1905 Herman Schneider was appointed to the professorship of civil engineering at the University of Cincinnati and at that time received permission from President Darney to start the co-operative course in the form of an experiment. In July 1906 over twenty students who were to start school in the fall started on their co-operative jobs. It was thought that by having the students start on the

job two or three months before the opening of school the weak ones would be weeded out. This was exactly the case with this starting class, as by September all those who could not or would not stick had quit and only six were left. The vacancies were filled by other applicants for the course, and a class of twenty-eight students was formally matriculated. At the same time one hundred and seven enrolled in the regular engineering course. From that time there has been a steady growth of the co-operative course.

Below is a record of the enrollment in both the regular and co-operative courses for the first eleven years of the co-operative plan.

	Enrollment in Regular Course	Enrollment in Co-operative Course
1906-7	107	28
1907-8	113	61
1908-9	106	84
1909-10	65	138
1910-11	56	176
1911-12	48	239
1912-13	44	294
1913-14	30	376
1914-15	34	424
1915-16	36	441
1916-17	27	473

The war caused a break in the steady climbing enrollment in the plan, but since the war it has again steadily progressed until today it has an enrollment of about two thousand students in its different branches which are by no means limited to engineering education.

In recent years the co-operative system of education has spread rapidly until today it is in operation in nineteen institutions throughout the country. The length of the co-operative courses at these various institutions varies from four to five years while the length of the co-operative periods varies from two weeks to one semester of eighteen weeks.

CHAPTER III

The purpose of the co-operative program at the General Motors Institute of Technology is to give the students training in both theory and its practical application in the factory, so that upon the completion of the course, they will be prepared for positions in various branches of the corporation, and have a foundation so that as they gain experience, they may qualify for responsible or technical positions in the future.

At the General Motors Institute of Technology, the co-operative plan as applied to engineering education is based on the theory that to be best qualified for industrial work, the student should have practical industrial experience as well as theoretical, technical training. It is also thought that the best results are obtained when the technical instruction and the practical experience in the factory are given in regular alternation periods.

The school is organized to take care of this type of training. Most of the students co-operate on a four-week basis, but some who work at the more distant branches of the corporation, co-operate on an eight-week basis. They alternate as is indicated on the chart following.

52 WEEKS										4 WKS	
4 WKS				8 WEEKS				4 WKS			
SECTION C 8 WEEKS	1	SCHOOL	1	2	2	3	VACATION OR WORK		VACATION OR WORK		
			WORK	WORK	SCHOOL	SCHOOL					
SECTION A 4 WEEKS	1	SCHOOL	1	2	3	VACATION OR WORK		VACATION OR WORK			
			WORK	SCHOOL	WORK	SCHOOL					
SECTION B 4 WEEKS	1	WORK	1	2	3	VACATION OR WORK		VACATION OR WORK			
			SCHOOL	WORK	SCHOOL	WORK					
SECTION D 8 WEEKS	1	WORK	1	2	3	4	VACATION OR WORK		VACATION OR WORK		
			SCHOOL	SCHOOL	WORK	WORK					

Under this arrangement approximately one half of the students are at work in the factory while the other half is receiving instruction in school. Sections A and B alternate at work and school each four week period, and sections C and D alternate each eight week period. The four weeks at the end of the year, coming in September, are available for vacations, and the students of the sections, A and B, C and D usually alternate at work so that all can have a two weeks vacation period.

It is planned to give the student the technical instruction in school which will meet his needs in later industrial life. The technical instruction and practical experience are correlated as closely as possible so as to be mutually helpful in obtaining a balanced development of the student. In the factory the student not only observes, but actually works along side of men in various branches of the industry and must meet the workman's problems and see what he is up against. In so far as possible, the student is shifted from one place to another in the factory to give him broad experience, contact with men, and opportunity to learn how to get along with others. It also permits him to see how men are handled as well as requiring him to work under supervision and to follow instructions himself.

In order that the student obtain the maximum benefit from this training, the plants and the school must work very close to each other. Individual differences in students make variations in the training schedule advisable. Therefore, work schedules for the student are planned by the management of the plant with advice from the school. These work schedules are so organized as to:

- (a) Provide definite work for the students
- (b) Require the students to make good as workmen
- (c) Provide a thorough, basic, mechanical, and technical training as a foundation for future work.
- (d) Provide broad experience to aid in determining the lines in which the student will most likely succeed.
- (e) Provide some practical experience directed into the fields of the students' respective choices.

An example of a work schedule will appear later in this thesis.

In order to make the training more effective, the student is required to write a co-ordination report during each work period upon some phase of the work in which he is engaged. This will be explained later.

As many students of all schools find it desirable or necessary to leave school before the completion of their course, the program is arranged so as to have a terminal point at the end of one, two, three, or four years, so that the student finding it necessary to drop out before the completion of his course will have obtained something of practical benefit both to himself and to the plant for which he is working.

Teaching in this type of school differs materially from the ordinary college or university in a number of respects. Courses must be organized which are more of a practical nature. A large number of irregular students must be taken care of, and an amount of work must be accomplished in six school months which the regular college or university accomplishes in nine months.

To meet the needs cited in some of the preceeding paragraphs, the curriculum of a course of this nature must be somewhat different from the ordinary college or university engineering course. For this reason many students entering with advanced credits from other colleges or universities find in the curriculum certain required courses which they have not taken. These courses must be incorporated in their programs thus making them irregular students. These students, combined with the students who fail certain subjects and others who wish to carry extra subjects, make the number of irregular students large. This large number of irregulars makes the arrangement of their individual programs difficult. For this reason a number of subjects must be taught on very nearly the individual basis. By this we mean that the subject must require all individual work such as the subject of Engineering Drawing. In this, a certain monthly requirement as to the number of plates is set up. Then the student who finds he must have an irregular schedule and cannot attend the regularly scheduled drawing classes for this section without conflict, may be able to accomplish the same ends by attending with another section. In a like manner the subject Machine Shop Work may be arranged in individual assignments of operations to be completed in certain periods of time. Chemistry and Physics laboratory experiments can be individual assignments which it would be possible to carry out in some other section as well as in the regular assigned section, should there be a conflict at that time. A few other subjects can be taught by the use of mimeographed questions and problems on certain phases of the text, and in this manner, these courses become largely individual work. With a few of the courses arranged in this manner the large number of ir-

regulars can be taken care of and efficient schedules made up for them.

To accomplish the usual nine months of school work in six, the students' schedules must call for more class hours and more outside work than in other schools. This makes the student carry a rather heavy load during his school month, but as the program calls for alternate months of work and school, we do not feel that the load is too heavy for the student's best efficiency.

What should be taught is determined not only by the industrial needs, but also by social and economic conditions. This being the case, subject matter must always have a large part to play in the determination of educational procedure. When it comes to a question of how we shall teach, we find a conditioning factor that modifies the emphasis which might otherwise be placed on subject matter. How we shall teach is largely determined by the individual student's nature. This means that special attention must be paid to individual needs and desires. The teacher's problem then becomes one, not only of teaching subject matter, as he knows it, but also of presenting it in a number of different forms so that all of the students may grasp it, whatever their background or adaptabilities. Then too, the teacher must be able to present the subject matter in such a way that it will be of interest to the student; otherwise the student will obtain little from the course.

A few teaching aids and methods which have a specific application in the co-operative course will be mentioned here. A good teacher should not forget the law of association which applies to the utilization of instincts for this is sometimes a great help

in teaching. If we want a student to take interest in a remote connection, one not natively interesting, we must make connections between some activity natively interesting and the remote activity with frequency and intensity. The resulting interest in the native activity will tend to become attached to the remote activity. There are many desirable associations to be had in the co-operative plan referring to things which the student has seen in the plant. For example, in physics we may refer to fulcrums, inclined planes, etc. In machine design and other such courses the student has, due to his shop experience, a vocabulary, and ideas which most students in the regular engineering college do not have. These are material aids in teaching the subject.

Correlation also aids greatly in arousing interest in students. For example, if we assure the student that the facts of engineering drawing will be used in connection with the pattern maker and the machinist, he becomes more interested in the subject. Then when he sees the actual routine of these things in the plant he realizes their importance.

If the teacher can but get a student to think and think along the desired lines, he has made a good start toward the goal which it is his desire that the student shall reach. The teacher should first endeavor to get the student to do associative thinking as this is a preliminary to selective thinking. Thinking, however, has a great bearing upon the development of initiative, originality, resourceful attitude of mind, etc., these however, are means and not ends. The end is the efficient application of these ideals, and such

applications imply necessity for attention to subject matter and methods. Associative thinking is more readily brought about in the co-operative plan due to the fact that the students have seen many things in the plant with which associations may be made.

A few of the objects and aims of the co-operative engineering college will be stated here. In a nationally known industrial plant the president of the company has long held up the following motto to his executives and foremen: "Teach, don't boss". In these three words lie the key to the relationship which should exist in every school shop. There should never be any question as to who is in control of the class, but that person should be a teacher and not a boss. Through teaching that is well planned, organized, and managed comes the kind of class control that is desired.

A good teacher must be able to see ahead. He must also see himself and what he is doing in a true relationship to what others are doing. A teacher in an industrial co-operative school, through his contacts with industry, should be in a position to see beyond the school-room walls and to evaluate his teaching in terms of the objectives that should prevail, the knowledge and skill that should be acquired, and the ideals that need to be established in those upon whom will soon fall the responsibility of carrying on industry and the world's work.

Men in industry know well that it takes more than a trade knowledge and skill to make a happy, successful worker. If all persons in industry had only a fair knowledge of the principles of economics, there would be less bitterness and strife. It would be

a tremendous step forward if all workers but had a fair understanding of the right relationship between individuals. The teacher who can see ahead not only will teach facts but will also endeavor to develop habits and ideals in his pupils that will be a long way toward making life worth while industrially, economically, and socially. A teacher who does his job well knows that he must spend a certain amount of time on facts covering the theory. He will also endeavor to see that each unit of instruction receives emphasis relative to life as a whole. This latter is not always possible, but should be given thought.

The job of industrial education consists in both meeting the present demands and in creating new demands for higher skill in industry. The first and most obvious need is to meet the present day requirements of industrial life. This means among other things, to prepare workers to meet in terms of quality and quantity the market demands in trade or industrial pursuits. But, another responsibility falls upon our shoulders. It is that of raising present standards and of improving current practice. To this end, we shall want to go beyond present demands when that can be done, and pioneer the way.

The present age, more than any preceding one, shows the necessity of keeping a problem-solving attitude toward life. Feats are being performed that a few years ago everyone thought impossible. American inventive genius and mechanical skill has created market demands and has established higher standards in many foreign lands. In a similar way we can expect the American youth of today, who are industrially trained, to establish new standards for both domestic and foreign markets. It is indeed true that "he who says it can't be done is soon overtaken by the man who has done it".

One thing which co-operative education must bear in mind is that the students are employed in industry part time. For this reason industrial education must be very direct, specific, and absolutely practical. All courses relating to shop must be taught on machines similar to those used in the shop to obtain the best results. Particular emphasis should be placed upon the development of reasoning ability, initiative, and qualities of adaptability to new situations, in our students.

Every profession including teaching, has its traditions, ideals, and standards of conduct. One of the earmarks of a professional man is that he constantly tries to have an open, unbiased attitude toward the new and untried things. In education we call it the "problem-solving" attitude or scientific attitude. When one loses this attitude, one ceases to grow mentally. The real professional man is always interested in progress, and he develops mentally as long as he serves in his profession. To such men their work is more than a job, more than bread and butter. It becomes a joy, a means of personal development and a means of service to others. For such men, the day is not measured by the clock or terminated by the sound of a whistle.

If a man has his work at heart, he will naturally want to have a professional attitude toward it; he will want not only to do constructive work, but to be well informed, and progressive - always looking for the best way to use his ability to further the best interests of those he serves.

The professional attitude of the teacher is to some extent measured by more or less obvious evidence such as: (1) The

professional literature read; (2) participation in conferences, teachers' meetings; (3) improvement in methods, plans, and school organization; (4) personal interest taken in the progress of students; (5) co-operation shown toward fellow teachers, supervisors and administrators; (6) instructional material developed and used, and (7) publication.

It has frequently been said that "teachers are born, not made". This statement is true only to the extent that teachers must be born with capacity to become good teachers through training and experience. Professional growth in teaching comes as the result of having ideals and working toward them; it comes as a result of mental and physical effort put forth by the teacher.

Many teachers would make good men for industry, but few of the best men in industry would make good teachers. This point must be watched carefully in selecting instructors for highly skilled subjects such as machine shop and pattern making.

C H A P T E R 17

The first step in comparing the way the students are selected at the General Motors Institute of Technology and Michigan State College will be an explanation of the method of selection at the General Motors Institute of Technology.

The prospective student's first inquiry about the course may be sent either directly to the institute or he may contact with the man in charge of the co-operative engineering students at the plant. When he applies to the institute, an annual catalog, a form letter, application blank, and a physical and health report blank are sent to the prospective student. Copies of the letter and the two blanks may be found on the following pages.

GENERAL MOTORS INSTITUTE OF TECHNOLOGY

FLINT, MICHIGAN

Dear Sir:

This office has your letter of inquiry in regard to the Co-operative Engineering Courses offered in General Motors Institute of Technology.

A copy of our annual catalog is being sent to you. This, we believe, will answer any questions you may have in mind about the nature of this program and the requirements for admission.

We shall be glad to have you write us if you wish additional information.

Very truly yours,

Registrar.

APPLICATION FOR ENROLLMENT
in the
CO-OPERATIVE ENGINEERING COURSE
GENERAL MOTORS INSTITUTE OF TECHNOLOGY
Affiliated with
INDUSTRIAL MUTUAL ASSOCIATION

I hereby make application for enrollment in your Co-operative Engineering Course. In consideration of your reserving a place for me in the 19.... class during consideration of this application, I enclose (check, draft, money order) for ten (\$10.00) dollars and should my application be accepted, I promise to complete agreement for the four-year course on the co-operative plan which is described in your bulletin and with which plan I am thoroughly familiar.

It is understood and agreed that if this application is accepted, the ten (\$10.00) dollars enclosed shall apply as part payment of my tuition, and should the application not be accepted the ten (\$10.00) dollars is to be returned to me promptly.

The facts hereinafter set forth are furnished to enable you to properly consider my application and are true to the best of my knowledge and belief.

Name (in full).....Age.....
Last First Middle
Address.....Married or Single.....
Street City State
Place of Birth..... Date of Birth..... 19.....
Race..... Naturalized..... Color.....
Parent's or Guardian's Name..... Relationship.....
Parent's or Guardian's Address..... Nationality.....
Parents Both living..... Father's Education..... Mother's.....
Father's Occupation..... Where Employed.....
Religious Preference..... Are you a Member?.....
What financial assistance outside of your own co-operative earnings
can you depend on?.....
..... From What Source?.....

PREVIOUS EDUCATION

Name and Address of High School.....
Number Years in High School..... Grade Completed..... Graduation....
Yes No Year
College or Trade School.....Course..... Years Completed.....
Other Education.....
.....
Studies Enjoyed Most in School.....
Part Taken in Extra Curricular Activities.....
(Music, Athletics, School Paper, Clubs, etc.)

PREVIOUS EMPLOYMENT

Employer..... Position..... Time Employed.....
.....

Every applicant will be required to furnish a health and physical certificate. A blank for this purpose will be sent you.

Every applicant accepted should provide himself with a birth certificate to bring with him when he reports for final registration.

Attach photograph of yourself. This should be a small size photograph taken with head uncovered. A good kodak picture will be satisfactory.

REFERENCES

NAME	ADDRESS	OCCUPATION
.....		
.....		
.....		

Date..... Signature of Applicant.....
Signature of Parent or Guardian.....

GENERAL MOTORS INSTITUTE OF TECHNOLOGY
Flint, Michigan
Affiliated with the Industrial Mutual Association

PHYSICAL AND HEALTH REPORT
To Accompany

Application for admission to the Co-Operative.....Course.

Date.....

NAME.....

ADDRESS.....

When were you last sick?..... What was the nature of
the illness?..... What is the state of
your health now?.....

SIGNED.....

(Applicant's Signature)

PHYSICIAN'S REPORT

.....

.....

HEIGHT..... WEIGHT.....

VISION,Right..... HEARING, Right.....

VISION,Left..... HEARING, Left.....

TEETH..... LUNGS.....

HEART..... VARICOSE VEINS.....

HERNIA..... VENEREAL INFECTIONS.....

LIMBS-Loss of.....

Flat Feet.....

DEFORMITIES.....

REMARKS.....

.....

.....

This man is physically fit for (heavy) (average) (moderate) (light)
work.

SIGNED.....M.D.

Uncorrected vision range greater than 20-40 is not acceptable.

If any defects in a man are noted other than those shown on his physical and health report blank they may be sufficient cause for his not being accepted for the course.

After the prospective student has received the above information and has decided to make application for entrance he is required to return the application blank and physical and health blank properly filled out, accompanied by a ten dollar deposit and a small photograph of himself. These may either be handed to the plant representative or sent direct to the institute. In the latter case a form letter is sent to the applicant, to each of his three references, and to his high school principal. The letter to the high school principal is accompanied by a school record blank which he is asked to fill out and return. Examples of each of the above will be found on the following pages.

GENERAL MOTORS INSTITUTE OF TECHNOLOGY

FLINT, MICHIGAN

Dear Sir:

We are glad to acknowledge receipt of your application for enrollment in our Co-operative Engineering Department and have sent for your high school record and letters of recommendation. Your application will be considered by our Admissions Committee upon receipt of these papers.

If you failed to include items required by the Committee, you will find them checked below. Kindly forward these items at your earliest convenience.

You will be notified of final action on your application.

Yours very truly,

Registrar.

\$ 10.00 deposit

Photograph (small)

Health Certificate

GENERAL MOTORS INSTITUTE OF TECHNOLOGY

FLINT, MICHIGAN

Concerning:.....

The young man indicated above has applied for admission to our Co-operative Engineering Course. He states that he is a graduate of your school.

This is a four year course of college grade designed to give young men a training both the theory of engineering and its practical application in the plant to prepare them for various phases of the work in industry with such a foundation that, as they gain experience, they may develop and qualify for more responsible or technical positions in the future.

The more complete information this office has on the character of the work done by this man in his preparatory school the better service it can render. Will you please co-operate with us in completing the blank certificate of credits we are enclosing with this request?

If you can give helpful information in addition to that asked for on the certificate we shall appreciate a supplementary letter.

Yours very truly,

Registrar.

Accompanying the letter to the high school principal
is a school record blank similar to the following:

GENERAL MOTORS INSTITUTE OF TECHNOLOGY
Flint, Michigan
School Record in Support of Application for Admission

The Committee on Admissions will be grateful for full and complete information concerning the candidate's academic record and for detailed answers to the questions on the reverse side of this blank. Will the principal please send this statement direct to the Institute, not through the applicant.

Name of Applicant, in full.....
Address of applicant.....Date of birth.....
Town State Year and Month
Name of School.....Location.....
The pupil attended this school from.....19...., to.....
19...., and (did not complete) (completed) (will complete) a
regular course, including all the requirements for graduation.
If more than four years were spent by the pupil in completing his
course, will you please give the reasons.....
If pupil was more than nineteen years of age upon graduation will
you please state the reason for his retarded progress.....
.....

STUDIES	Year Studied	Periods Per Week	No. of Weeks Studied	Grade in Subject	Credit Allowed
English 1st yr.					
English 2nd yr.					
English 3rd yr.					
English 4th yr.					
Algebra					
Algebra, advanced					
Geometry, plane					
Geometry, solid					
Trigonometry					
Physics					
Chemistry					
Biology					
General Science					
If Laboratory work was given with the science courses, please check here					
Civics					
Economics					

STUDIES	Year Studied	Periods Per Week	No. of Weeks Studied	Grade in Subject	Credit Allowed
Foreign Language 1st yr.					
2nd yr.					
3rd yr.					
4th yr.					
General History					
Med. & Mod. History					
Anc. History					
U.S. History					

Directions:

1. In the column "year studied", please use the numbers 1,2,3,4,5, to designate the year of the course in which the subject was taken.
2. If work done in other schools is entered, please give the name of the school in the "studies" column.
3. If the letter system of grading is used please record the numeral equivalent instead of the letter grade.
4. If any of the work recorded was done in other than the regular morning and afternoon sessions of school please make note of that fact.
5. If applicant attended junior high school before entering the senior high school, please indicate the credits he earned there.

ANSWERS TO THE FOLLOWING QUESTIONS
WILL BE GREATLY APPRECIATED

1. Is your school accredited by your state university?.....
2. What grades are necessary for recommendation to college?.....
What is the minimum passing grade?..... (If a letter system of grading is used please record the numerical equivalent).
3. How many pupils were, or probably will be, graduated from your school in the same class with the pupil?.....
4. Will you please state the pupil's rank in his class?.....
(Give this numerically if possible; otherwise state whether he is in the highest quarter, second quarter, third quarter, or lowest quarter.)
5. In what school activities was the pupil engaged?.....
.....
6. Are there any special circumstances connected with this pupil which the Institute should know before deciding upon the merits of his application or in dealing wisely and sympathetically with him if admitted?.....
.....
7. Do you recommend the candidate for college work?.....

Date

Signature of Principal

Flint, Michigan

```

.....
Last name                First name                Middle initial
Application received (date).....
$10.00 deposit received (date).....
Number of Receipt.....
Refund made.....
      Date                                Check Number
High School Certificate sent (date).....
High School Certificate received (date).....
References written for (date).....
References received (date).....
                        1          2          3          4
Health Certificate sent (date).....
Health Certificate received (date).....
Rating on application.....
                        Rate by 1,2,3 and 4
Accepted by School (date).....
Referred to (Plant).....
                        Unit
      (date).....
Acceptance received from (Plant).....
                        Unit
                        (date).....
Referred from (Plant).....
                        Unit
Plant notified of Committee action (date).....
.....
      Approved                                Disapproved
Applicant notified of acceptance (date).....

```

- Use red pencil and indicate by 1, excellent; 2, good; 3, fair; 4, poor.

In considering this procedure, it should be borne in mind that all students admitted to this course are employees of the Divisions of the Corporation and must be first of all selected and approved for this training by officials of the Divisions and approved by the Institute.

If application is made to the plant, the plant representative may consider it first from the standpoint of the plant qualifications required and if favorable, refer the application to the Institute for check of the Admissions Committee following the procedure previously outlined.

If the application is made directly to the Institute, or in case a plant representative desires to have the Institute make a check in advance of his decision, the Institute Admissions Committee makes the check previously referred to, and then refers the papers back to the plant representative, with information as to their action.

When all of the required information is in, the admissions committee meets and gives the prospective student a rating as one, two, three, or four. This rating is based on a number of points. Some of the points considered are as follows: high school record, standing in class, mathematics taken, science taken, English taken, recommendation of school, extra curricular work in high school, advanced education, work record, general recommendations, and age. After the applicant has been thus graded he is assigned to a plant if he has signified a certain preference. If he has not signified a preference, he is asked if he has any, and if not he is assigned to one where there are vacancies. After a plant assignment is made and the applicant has been accepted by both plant and college, the following form letter is sent to the applicant.

GENERAL MOTORS INSTITUTE OF TECHNOLOGY

FLINT, MICHIGAN

Dear Sir:

We are pleased to learn that your application for admission to the Co-operative Engineering program of this Institute has been approved, and we shall look forward with pleasure to your connection with this fine group of young men in training for future technical or other responsible positions in General Motors.

You may expect to be notified of the time at which you will begin your work.

If you should desire any further information concerning your prospective life at the Institute prior to your coming here this fall, do not hesitate to ask your contact representative or to write to us. We are ready to assist in any way in the making of your stay with us of maximum benefit to you.

Sincerely yours,

Registrar.

The foregoing pages show the general method of selecting students for the co-operative engineering program at the General Motors Institute of Technology.

The number of students admitted to the course each year depends upon the number of men that the divisions of the corporation desire to have trained in this way.

The number from the different plants varies from a minimum of two to a maximum of thirty per year.

For the purpose of comparing this method of selection with that used at Michigan State College we shall give below the method at Michigan State College. The big difference is due to the fact that Michigan State College is a state institution.

Michigan State College application blanks are available at the office of almost any high school in the state or may be obtained upon request of high school principal or applicant.

The following type of application blank is used. It must be filled out partially by the applicant and partially by the high school principal. The principal then mails the application to the registrar.

MICHIGAN STATE COLLEGE
East Lansing, Michigan

APPLICATION FOR ADMISSION

PART I
General Information

To be filled out by the applicant in his own handwriting in ink.
(Fill in completely to avoid delay.)

1. Name in full.....
(First) (Middle) (Last)
2. Home address.....
(Street and number) (City) (State)
3. Birthplace.....Date of Birth.....
(Month) (Day) (Year)

4a. (a) Father's full name: (First) (Middle) (Last) Living.....Deceased..... (b) Father's present occupation..... (c) Father's education, (check if graduate; other- wise give number of years in attendance) Grade school..... High school....College...	4b. (a) Mother's full name: (First) (Middle) (Last) Living.....Deceased..... (b) Mother's education,(check if a graduate; otherwise give number of years in attendance) Grade school..... High school....College...
--	--

5. Are you a citizen of the United States?..... Nationality.....
6. (a) Have you contributed toward your support while in high
school?.....
Nature of employment.....
Approximate number of hours employed per week during school
year.....
(b) If you have worked since graduation from high school, state
positions held and duration of each term of employment.....
.....
7. (a) Name high school subjects you like best and give reasons....
.....
(b) Name high school subjects you disliked most and give reasons
.....
.....

- (c) List any particular honors, prizes, or other special awards for scholarship obtained in high school.....
- (d) List any and all subjects in which you received grades of failure in high school, and give reasons.....
-
- (e) List any and all subjects which you dropped before the semester's end, and give reasons.....
8. (a) Make a complete list of the sports and other extra-curricular school activities in which you participated in high school.....
-
- (b) What special recognition, if any, have you received in any of these activities?.....
- (c) Which, if any, of these activities do you intend to continue in College.....
9. (a) Have you at any time applied for admission to any other college or university?..... If so, give full details of the outcome of your application.....
- (b) Have you attended any college or university?.... If so, give name of institution, time spent there, etc.....
-
10. When do you expect to enter college?.....

11. Check course desired
in College.....
- | | |
|--|-----------------------------|
| | Agriculture |
| | Forestry |
| | Applied Science (including |
| | Pre-medical and Pre-dental) |
| | Engineering |
| | Home Economics |
| | Liberal Arts |
| | Business Administration |
| | Physical Education |
| | Veterinary Medicine |
| | Medical Biology |
| | Public School Music |
| | Music |
| | Hotel Training |
12. (a) What are your plans for financing your college course during the first year?.....
- (b) If you must have outside employment, how many hours daily do you expect to give to it?..... Is this employment already arranged?.....
13. If one year or more has passed, since your graduation from high school, state whether or not and how your attitude toward higher education has changed.....
-
14. Give names, addresses and occupations of at least two responsible adult persons (not your former school teachers or officers, or relatives) as references.....
-
15. What assistance, if any, have you had in filling out this blank?.....
-
16. State condition of general health, naming any illness which may have handicapped you while in high school.....
17. Please place in the space below a small, unmounted, late photograph or snapshot of yourself, and then promptly deliver this blank to the Principal of your high school for its completion.

PART II

CANDIDATE'S PERSONAL QUALIFICATIONS
(To be filled out by principal or superintendent)

1. To the high school official:

- (a) Please indicate your judgment of the candidate by placing check marks on the scale of rating given below.
(b) If a rating on any trait is omitted, it will be understood that you do not have sufficient knowledge of the candidate to express a judgment. Such omissions will not put the candidate at a disadvantage.

Trait	Very low	Low	Fairly high	High	Very high	Extra-ordinary
Potential Intellectual Capacity.....						
Actual Intellectual Performance.....						
Seriousness of purpose....						
Originality.....						
Tractability.....						
Social-mindedness.....						
Independence of effort....						
Popularity.....						

2. State defects or qualities, if any, which are not covered by the rating scale given above.....
.....
3. To what degree did the candidate's attitude towards scholastic work and application to academic subjects change during the last year or two in high school?.....
4. Describe any particular circumstances of the candidate's environment, personality, or fortunes of life that may have been influential in determining the record made in high school.....
.....
5. Has a statement of the applicant's credits been submitted to any other college or university?..... If so, when and to what school?.....
6. Does the candidate measure up to your idea of a good first-year college student?..... If not, does he or she seem to have a latent capacity for the necessary development?.....
.....

Date

Principal or Superintendent

PART III

HIGH SCHOOL RECORD AND CERTIFICATE OF RECOMMENDATION

1. High school..... Located at.....
2. Student's name.....
(First) (Middle) (Last)
3. Date of graduation.....
4. (a) Years in attendance.....
(b) Names of and years in attendance at other high schools, if any, which candidate attended and from which credits were accepted.....
Average grade
5. (a) Passing grade of school Subject grade (Cross out one).....
(b) Grading system used (give numerical equivalents of letters, when letters are used).....
6. Length of recitation period..... Length of laboratory period.....
Average
7. Grade Subject (Cross out one) required for recommendation to College.....
8. (a) If candidate took mental tests, please give:
Name of test.....
Date given.....
Point score,.....
I. q.
9. (a) Number in candidate's graduation class.....
(b) Applicant's rank in class, from highest downwards.....
(c) General rank in class (check one): (Upper third).....
(Middle third)..... (Lower third).....
10. Subjects failed by years (please give complete record).
First year.
Second year.
Third year.
Fourth year.
11. I hereby certify the following record and do not officially recommend the candidate for admission without examination to
without trial
Michigan State College.

Date

Principal or Superintendent

(Blank must be sent directly to the College Registrar by the official who signs it.)

Unit Value	STUDIES	Year When Taken (I II III IV)	No. of Weeks Pursued	No. of Hours Per Week	Scholar- ship
	ENGLISH COMPOSITION and LITERATURE:				
	First Year				
	Second Year				
	Third Year				
	Fourth Year				
	HISTORY:				
	Anc.				
	Med. and Mod.				
	U.S.				
	English				
	CIVICS:				
	MATHEMATICS:				
	Algebra, 1st yr.				
	Algebra, 2nd yr.				
	Geometry, Plane				
	Geometry, Solid (Incl. Spherical)				
	Plane Trigonometry				
	Lec.				
	PHYSICS Lab.				
	CHEMISTRY Lec.				
	Lab.				
	Lec.				
	BOTANY Lab.				
	Lec.				
	ZOOLOGY Lab.				
	Lec.				
	BIOLOGY Lab.				
	PHYSIOGRAPHY Lec.				
	Lab.				
	AGRICULTURE				
	First year				
	Second year				
	Third year				
	LATIN:				
	Grammar and Reader				
	Second Year				
	Third Year				
	Fourth Year				
	FRENCH:				
	Grammar and Reader				
	Second Year				
	Third Year				

Unit Value	STUDIES	Year When Taken (I II III IV)	No. of Weeks Pursued	No. of Hours Per Week	Scholarship
	FRENCH:				
	Fourth Year				
	GERMAN:				
	Grammar and Reader				
	Second Year				
	Third Year				
	Fourth Year				
	SPANISH:				
	First Year				
	Second Year				
	Third Year				
	Fourth Year				
	FREE HAND DRAWING:				
	(Please indicate single or double periods)				
	COMMERCIAL WORK:				
	First Year				
	Second Year				
	MANUAL TRAINING:				
	(Please indicate single or double periods)				
	DOMESTIC SCIENCE:				
	(Please indicate single or double periods)				
	DOMESTIC ART:				
	(Please indicate single or double periods)				

Mark (1) any subjects occupying double periods. Specify by PG any subjects taken subsequent to graduation.

Please fill out the blank completely, using typewriter if convenient.

If student took work in part or entirely in New York State or in Canada, Regents' grades or Matriculation Examination grades must be given.

ADMISSION REQUIREMENTS

The requirements for admission are stated in terms of units; a unit meaning a subject pursued through a school year with not less than four recitation periods each week. Fifteen units are necessary.

(a) Required, seven units (for Engineering Courses).

English, three units.

Algebra, one and one-half units.

Geometry, one and one-half units (plane and solid, including spherical).

Physics, one unit.

Group one, four units.

Group two, four units.

(b) Required, five units (for Agriculture, Home Economics, Forestry, Veterinary, Applied Science, Medical Biology and Physical Education Courses).

English, three units.

Algebra, one unit.

Geometry, one unit.

Group one, four units.

Group two, six units.

(c) Required, seven units (for Liberal Arts, Business Administration, Hotel Training and Public School Music Courses).

English, three units.

Algebra, one unit.

Plane Geometry, one unit.

Language, two units.

Group one, four units.

Group two, four units.

GROUP 1

From this group four units must be chosen, the number of credits acceptable being shown.

English, 1 unit.

Mathematics, 1 or 2 units.

Physics, 1 unit.

Chemistry, 1 unit.

Zoology, 1/2 or 1 unit.

Physiology, 1/2 or 1 unit.

Botany, 1/2 or 1 unit.

Physiography, 1/2 or 1 unit.

General Science, 1, 2 or 1 unit.

Geology, 1/2 or 1 unit.

History, 1, 2, 3 or 4 units.

Language, 2, 3, or 4 units.

GROUP 2

Six units may be taken from this group for all courses except Engineering and Liberal Arts. In the Engineering and Liberal Arts four units may be taken from this group.

GROUP 2

This group is made up of subjects not included in Group 1 which are accepted for graduation by accredited high schools.

If the application shows that the applicant was in the upper or middle third of his or her class or even ranked high in the lower third he is sent an admission card of the following type.

Agricultural College No..... of Agriculture and Applied Science CARD OF ADMISSION			
Name.....			
.....			
Number	Street	City	State
is admitted to the.....Course on diploma from.....			
..... presenting the following acceptable units for entrance.			
English.....Pub.Speak.....History.....Sociology.....			
Economics.....Civics.....Algebra.....Geom. I.....Geom. II.....			
.....Trig.....German.....French.....Spanish.....Latin.....			
Physics.....Botany.....Chem.....Physiol.....Ecol.....			
Physiol.....Biology.....Draw.....Con'l Work.....Agric. Cult.....			
Dom. Sci. and Art.....M. A. Train.....Total.....			
Conditional in.....			
.....			
Registrar			
To be presented at.....			

If the applicant's record is very poor, the application is referred to the admissions committee. The admissions committee consists of a representative of each department of the college. Applicants are sometimes admitted on trial and sometimes refused admission. During the past few years approximately one hundred applicants per year have been refused. If the student is accepted and receives an admission card he is required to appear for freshman week during which he registers, goes to see his class adviser and has his schedule arranged. More about these arrangements will be given later.

C H A P T E R V

Handling of students and keeping of student records is of necessity much more complicated at a co-operative college than it is at the usual college. At the General Motors Institute of Technology, in addition to handling the students the co-ordination department keeps a number of records of the student. The records that are kept by this department affect materially the way the students are handled. Some of the duties of the co-ordination department are as follows: Co-ordination conferences of plant officials, plant contacts by members of the administration and co-ordination staffs, student placement, progress reports (school and plant), work schedules, co-ordination reports, co-ordination classes, personal interviews with students, co-operative clubs in plants, and follow-up of graduates. Some of these will be explained on the following pages.

An example of one of the forms of records kept at the General Motors Institute of Technology.

Line-Year	Class	Exam	Score	Grade	Remarks	1930-31
Gen. Credits	1	2	95			
W. Class Load						
Lo 3 Factor						
Doe, J.L. III	1	2	95			
27/27 1.00						
Koe, R. II	9		12			
28/32 .875						

It may be well at this point to add an explanation of the foregoing record form:

The records are kept on sheets headed by the name of the co-operative company at which the student works. In this condensed form one sheet will carry a record of several students. In the above illustration there are two examples. In the first column we find J. E. Doe to be in his third years work and to be carrying twenty-seven credit hours of work. (This is indicated by the twenty-seven in the numerator) We also note that the average class schedule has twenty-seven credit hours. (This is indicated by the twenty-seven in the denominator) The next figure 1.00 is the load factor which he is carrying. In the second example we note that R. Roe, a second year man, is carrying twenty-eight credit hours whereas the class average is thirty-two. This gives him a load factor of .875. In the next column we find the photographs of the men. Under the class standings we find two columns and note that J. E. Doe is in the first or upper tenth of his class and ranks second in his class while R. Roe is in the ninth tenth of his class and is not given a ranking due to the fact that only the five high men of the class are given an individual ranking. In the next column we find the individual class absences. This represents the absences from all classes for any reason whatsoever. We note that J. E. Doe had no absences while R. Roe had twelve individual class absences. In the next column we find the grade received on the co-ordination report which the student is required to write during his work month. This report is on some subject in the plant related to his school work. The co-ordination reports are graded by foremen in the plant and the Co-ordination and English departments at school. A composit of these

grades is the grade received on the report. Referring to the record we find that J. E. Doe made a grade of ninety-five on his report while the X in the same column of A. Roe's record shows that he failed to hand in a report. In the next column we find the student's quality point rating at the institute. The quality point rating at the General Motors Institute of Technology is something similar to the point system at Michigan State College. The quality point rating is a relative measure of the student's accomplishment. It is found by the following formula.

$$\frac{(G_1-75)C_1 + (G_2-75)C_2 + (G_3-75)C_3 + \dots}{C_1 + C_2 + C_3 + \dots} \times 4 = \text{Quality Point}$$

In the above G_1 = Grade received in one subject
 C_1 = Credit hours of that subject
 G_2 = Grade received in another subject
 C_2 = Credit hours of that subject
 etc.-----

To use the above formula the passing grade of the college must be seventy-five. Now we note that (G_1-75) will give the difference between the grade made and seventy-five or passing whether it be positive or negative. This difference is then multiplied by the number of credit hours of the subject. This is done for all subjects carried and these figures all added and divided by the sum of all credit hours being carried. This is then multiplied by four. By multiplying by four we set the maximum quality point at one hundred because if the student made a perfect grade in each course the $(G-75)$ in each case would be twenty-five, the factors for the credit hours in this case would cancel and the twenty-five multiplied by four would give a quality point rating of one hundred. In the same manner if the student made a grade of seventy-five in all cases the

(G-75) terms would all be zero and his quality point rating would be zero. From this we see that based on a passing grade of seventy-five if the student did a grade of work equivalent to seventy-five his quality point rating would be zero and if he did perfect work or an average of one hundred his quality point rating would be one hundred. If his average was below seventy-five he would have a negative quality point. Thus we see that above passing the quality point range is from zero to one hundred and below passing is from zero to a negative three hundred. By this system there is considerable difference in a student's quality point rating if he fails a course with a grade of sixty-nine or if he fails with a grade of thirty. All students in a class are arranged in order of quality point rating and then divided into ten equal groups. In this manner the tenth of the class into which the student falls is determined. This is really of more value in getting a comparison of the student's accomplishment than the actual quality point rating itself. If certain instructors grade high or low this will show up in the quality point rating, but assuming that the instructor grades his students accurately (whether high or low) and all students of a class take the same subjects from the same instructors, then whether the quality points are all high proportionally or low proportionally, the dividing of all the class into tenths gives an accurate comparison of the relative accomplishment of the individual.

The quality points are plotted on the record by drawing a line equal in length to the quality points received. We note that J. E. Doe received seventy-four quality points for the period while R. Roe received a negative twenty-eight quality points.

The B2S in R. Roe's quality point space indicates that he has received a failing grade in first year mathematics. He evidently failed mathematics the first year and is failing again this year. The C2D indicates that he has received a deficient grade in physics, and the F2S indicates that he has received a failing grade in English. In the next column we find the plant quality point rating. This rating is calculated at the institute from a progress report sheet received from the plant. On the following page is an example of this progress report.

GENERAL MOTORS INSTITUTE OF TECHNOLOGY
PROGRESS REPORT--CO-OPERATIVE ENGINEERING STUDENT

Mr.Department.....Division.....

Kindly fill out the following report of the work and conduct of the indicated Co-operative Engineering Student who has been working in your plant during the period indicated. This information is requested to assist the Institute in determining the student's progress and also his capacity and aptitude in practical work. The report will form a part of the student's permanent record at the Institute.

It is suggested that the person having the most intimate knowledge of the student's work make the rating by comparing him with the average man in the same department. The relative position of the check in the space provided will give the student a definite grade for each characteristic.

Student..... Year..... Period..... to.....
Plant..... Dept..... Clock No..... Rate.....
Nature of job to which student was assigned for the period.....
.....

CHARACTER- ISTICS	INDICATE STUDENT'S RATING WITH CHECK MARK						
ATTITUDE TOWARD WORK	20 Enthusiastic	15 Interested	10 Average	5 Indifferent	0 Not Interested		
WORKMANSHIP	20 Excellent	15 Above Average	10 Average	5 Fair	0 Poor		
CO-OPERATION	20 Excellent	15 Willing	10 Average	5 Indifferent	0 Obstructive		
CONDUCT	20 Exceptional	15 Above Average	10 Average	5 Below Average	0 Troublesome		
FITTING INTO DEPARTMENT	20 Exceptional	15 Above Average	10 Average	5 Below Average	0 Misfit		
EVIDENCE OF FUTURE VALUE	20 Exceptional	15 Learns Readily	10 Average	5 Learns Slowly	0 No Future		
ATTENDANCE	10 Regular	5 Irregular	Number of Days Absent				
PUNCTUALITY	10 Regular	5 Irregular	Number of times late				

Remarks.....
.....
Suggested Subjects for Co-ordination Report Assignments for Next Work
Period.....
.....

Date.....

Signed.....

GENERAL
PROGRESS REPORT

Mr.

Kindly fill out the indicated Co-op in your plant during requested to assist and also his capacity will form a part of

It is suggested ledge of the student average man in the check in the space for each character

Student.....

Plant.....

Nature of job to v
.....

CHARACTER-ISTICS	INDI
ATTITUDE	Enth
FORWARD WORK	
WORKMANSHIP	Exce
CO-OPERATION	Exce
CONDUCT	
FITTING INTO	Exc
DEPARTMENT	
EVIDENCE OF	Exc
FUTURE VALUE	
ATTENDANCE	Reg
PUNCTUALITY	Reg

Remarks.....

Suggested Subject

Period.....

Date.....

a-	o	a	ol	al	os
a-	o	a	ol	al	os
a-	o	a	ol	al	os
a-	o	a	ol	al	os
	o		a		ol
	o		a		ol

GENERAL MOTORS INSTITUTE OF TECHNOLOGY
PROGRESS REPORT--CO-OPERATIVE ENGINEERING STUDENT

Mr.Department.....Division.....

Kindly fill out the following report of the work and conduct of the indicated Co-operative Engineering Student who has been working in your plant during the period indicated. This information is requested to assist the Institute in determining the student's progress and also his capacity and aptitude in practical work. The report will form a part of the student's permanent record at the Institute.

It is suggested that the person having the most intimate knowledge of the student's work make the rating by comparing him with the average man in the same department. The relative position of the check in the space provided will give the student a definite grade for each characteristic.

Student..... Year..... Period..... to.....
Plant..... Dept..... Clock No..... Rate.....
Nature of job to which student was assigned for the period.....
.....

CHARACTER- ISTICS	INDICATE STUDENT'S RATING WITH CHECK MARK				
ATTITUDE	Enthusiastic	Interested	Average	Indifferent	Not Interested
FORWARD WORK	☒				
	Exceptional	Above Average	Average	Fair	Poor
WORKMANSHIP	☒				
	Excellent	Willing	Average	Indifferent	Obstructive
CO-OPERATION	☒				
	Exceptional	Above Average	Average	Below Average	Trouble- some
CONDUCT	☒				
FITTING INTO DEPARTMENT	Exceptional	Above Average	Average	Below Average	Misfit
	☒				
EVIDENCE OF FUTURE VALUE	Exceptional	Learns Readily	Average	Learns Slowly	No Future
	Promise	Good Timber	Promise	Quest. Promise	Promise
	☒				
ATTENDANCE	Regular	Irregular	Number of Days Absent		
PUNCTUALITY	Regular	Irregular	Number of times late		

Remarks.....
.....
Suggested Subjects for Co-ordination Report Assignments for Next Work Period.....
.....

Date..... Signed.....

Attached to the foregoing report on transparent paper is an explanation of how the points are determined for each characteristic of the progress report rating. The relative position of the check mark gives (as can be easily seen by use of the transparent paper shield) a definite grade for each characteristic. To illustrate, the check marks on the above report indicate the rating received by J. E. Doe. From the position of the check mark we find that his attitude toward his work was a high degree of interest giving him fourteen points, his workmanship and co-operation rated very high giving him nineteen points each. His conduct was above average giving him fifteen points. His ability to fit into the department gave him seven points and his evidence of future value gave him nine points. The sum of all these points as indicated at the right gave him a plant quality point rating of eighty-three. For the same period we note that R. Roe received a plant quality point rating of thirty-five.

A rather brief explanation of the co-ordination report will be given here. The co-ordination reports are considered a very important factor in the training program of the individual student and should prove of great benefit in training him for future usefulness in the plants. The reports give the student several types of training. The first type we will mention is training in observation. When the student makes an intensive study of his subject as he should, especially if that subject has to do with his daily work in the plant, he receives excellent training in observation. Many reports received in the past indicate that this is being accomplished to a very large degree. The second type of training the student should get is training in library study. It has been said that the educated man is one who knows where to find information when he needs it. Libraries are

the great storehouses of information, and one objection to many engineering courses is that students do not become very much acquainted with library facilities. Many of the co-ordination reports require extensive use of the library. The third type of training which the student should get from these reports is training in expression. Many engineers lack the ability to express themselves properly, either orally or in writing. Continued writing of these reports is a great help in removing this shortcoming. Last but not least of the types of training the student should get from writing these reports is training in English. The fact that the reports are graded by the English department and, in cases where it seems advisable, reviewed with the student gives the student an opportunity to improve greatly his written English.

Co-ordination reports are considered a great aid in appraising the ability of the student and guiding his development. Many students have brought themselves very favorably to the attention of the management by the excellent quality of the reports which they have written. In some cases they have been made the basis of changes in shop procedure.

The selection of the report topic is very important as the basic reason for writing a co-ordination report is to aid the student in studying his job and in becoming of more value on his job. For this reason it is important that the report bear a close relationship to the work being done by the student at the time the report is written.

The reports are graded at the plant for proper content and by the Co-ordination and English departments at the college. The

student during the last week of school of each month has the opportunity of going over his report with these departments.

Somewhat along the same line but with broader scope is the co-ordination class held twice a week when the student is in school. The objective of this class is to acquaint the student body as a whole with the products, systems, aims, ideals, and any other matters of interest pertaining to the corporation and its various units. In this class students from various plants are called upon to give reports. The student is notified that he is to give a report by the following form:

GENERAL MOTORS INSTITUTE OF TECHNOLOGY
Co-ordination Department

Mr.

Date.....

You are assigned to give a 10 to 15 minute talk in your Co-ordination Class EO-3, during your next school period. Definite class assignment will be made by Bulletin Board notice after you return.

You should select a subject which is of special interest to you and which you think will be of interest and profit to the class. The following are suggested as fields from which suitable subjects may be selected:-Manufacturing processes, systems, handling equipment, etc. used in your plant. You are expected to give a technical discussion of the subject selected similar in nature to a paper for a S. A. E. meeting. Your report will be graded on content, interest and delivery, and the grade you receive will be a part of your monthly grade in this class.

Please fill out the following form answering all questions and including a detailed outline of your report. Hand in to Co-ordination Department office immediately upon your return to school. This form is due on the first day of your next school period.

Report Subject _____

Will you bring charts, diagrams or other display material from your plant to illustrate your talk? - - - - - Yes No

Will you bring samples of your products, sample forms, etc? Yes No

If you bring samples, will you have enough to pass around the class? - - - - - Yes No

Will you require any material to be duplicated on the Ditto or Mimeograph, or Blue Printed, to aid in getting your talk across? - - - - - Yes No

(If "Yes", make arrangements with Co-ordination Dept. as soon as you return).

Will you need to use the Reflectoscope in your presentation? Yes No

If you plan to put sketches on the blackboard, will you arrange to get them on before time for class? - Yes No

Outline of Talk (Use Reverse side if necessary)

Another important phase of the Co-ordination department is its work in student interviews. Individual student interviews are held for various reasons. A five minute interview near the end of each month voluntary on the part of the student, affords an opportunity for him to go over his records, plant reports, and co-ordination report. Immediately upon the student's return to school from a work period he is called in for an interview if he has received a deficient or failing grade. During this interview constructive suggestions are brought to the student. In this the Co-ordination department is aided by reports turned in by each instructor when he gives a deficient or failing grade. These reports state (if possible) the reason for the low grade and suggestions for improvement. Miscellaneous interviews may be had by student request at any time to straighten out any difficulties which may have arisen. By aid of personal interviews a better understanding of the relationship of the school to the plant is brought to the student. A large number of students, sometimes even in upper classes, fail to appreciate the basic relationship existing between the plant and the Institute, and where they fit in the plan. They sometimes fail to realize that they are primarily employees of the plant both while at the plant and while at school. They think of themselves primarily as students and fail to grasp the significance of their work periods in the plant. Often an interview will straighten out this wrong impression and will send them back to the plant with renewed determination to make good and an increased realization of the educational values which are inherent in their work schedules. Interviews are also helpful to some seniors who in general try to lay their plans too far in advance and are liable to become discouraged if their hopes and aspirations are not

immediately realized.

Another duty of this department is the regular absence routine, for which we will not take the space to explain.

Records such as credits earned toward graduation and advanced credits are kept by the registrar. These, of course, are very similar to those kept at the ordinary college so no explanation will be given. One difference in reports, however, should be mentioned. At most colleges the grades of the students are sent to the parents or guardians whereas at the General Motors Institute of Technology they are sent to the student and the plant contact men, the plants being very much interested in the progress of the student while in school.

In considering the records kept by the Dean's office at Michigan State College we shall first show how the student is classified. First, the student pays his fees. After paying fees he goes to a central office, which, previous to his coming has checked over the subjects which he has indicated he wishes to take. This central office in checking his schedule assigns the student to certain sections, endeavoring to keep the sections balanced. After his subjects and sections are approved at this office he goes to the Dean's office to make out his schedule and classification card. He makes out first a classification card of the type shown on the following page.

ENGINEERING COURSE Senior Year			
Name.....		Date	
Last Name First Name			
Home Address.....			
Local Address.....		Class Officer.....	
Sec.		Sec.	
No subject may be added or dropped unless authorized by Class Officer and Registrar.			

Next a card of the type shown below is made out for each subject which the student wishes to take.

Division _____		Date _____	
Name _____			
Last name	First name	Middle name	
Subject _____		Section _____	
Subject and number			
Grade _____		Credits _____	
		Class Officer's or Department Stamp	

This card goes to the department teaching this subject. The classification card is pasted on the student's permanent record card and the grades made in the subjects added. Each term another one of these cards is added to the record. The individual classification card

which is shown above is kept by the department which is teaching the subject until the course is completed. The grade is then entered in on the new card and is sent to the Registrar's office. If the student wishes to make any changes in registration or drop any course the following card is used:

MICHIGAN STATE COLLEGE		
of		
Agriculture and Applied Science		
To the Registrar:	Date.....193-	
I recommend changes in registration of		
Mr.....		
Drop.....	Section.....	
.....	"	
.....	"	
Add.....	"	
.....	"	
.....Class Officer		

This card is sent to the Registrar and when the changes or drop has been officially made, a card of the following type is given to the student.

MICHIGAN AGRICULTURAL COLLEGE	
Date	
Mr.....	
has permission to - - -	Drop..... Sec.....
	transfer to Section.....
Not valid unless stamped by Registrar	

Following is shown another record which gives a rather condensed permanent record filled in at the end of each term. This is kept by the Dean's office.

Scholarship

Record of.....
 Home Address.....
 Entrance Birth Place.....Year....
 Conditions Parent or
 Guardian.....
 Advance
 Credits from.....
 U.S. Trig
 Required ()
 Not () Course.....

Term	Earned		Shortage	Excess	Advance	Req. Crs.
	Crs.	Pts.				
F						
W						
S						
Total						
F						
W						
S						
Total						
Sum						

(over)

Name.....

Term	Earned		Shortage	Excess	Advance	Neg. Crs.
	Crs.	Pts.				
F						
W						
S						
Total						
Sum						
F						
W						
S						
Total						
Sum						

REMARKS:

Following is one of the records kept by the Registrar's office.

Parent or Guardian		Date of Birth		Place	
		Honors			
		Sec. Att.		Cr. for Grad.	
Entrance					
School					
English					
History					
Algebra					
Geometry Pl.					
Geometry Sol.					
Trigonometry Pl.					
German					
French					
Spanish					
Latin					
Physics					
Botany					
Chemistry					
Physiography					
Zoology					
Physiology					
Biology					
Gen.Science					
Drawing					
Civics					
Com'l Work					
Agriculture					
Home Econ.					
Man.Training					
Ent. Cond.					

Over

At Michigan State College there is a point system in use which takes the place of the quality point system which is in use at the General Motors Institute of Technology. In this system the student receives three points for each credit hour of a course in which he receives an A grade. He receives two points for each credit in a course in which he receives a B grade; one point for each credit in a course in which he receives a C grade; no points in courses in which he receives D grades, and a negative point for a failing grade. For graduation the student must have at least as many points as he has credits.

One phase of handling students at Michigan State College and the General Motors Institute of Technology which is very similar is the adviser system. Faculty members are appointed as student advisers each having about fifteen to twenty students assigned to him. The adviser has the opportunity of examining the record of all his students. The purpose of the adviser is practically the same at both institutions. The adviser is the one member of the faculty to whom the student may come with his problems and troubles. At Michigan State College the advisers do not call their students in to talk with them about low or deficient grades, because that is not the adviser's job. To the student's knowledge the adviser knows nothing of the grades being received by him. Thus, if the student knows that he is not to have the subject of deficient grades brought up when he sees his adviser, he feels more free to discuss his troubles or problems. At the General Motors Institute of Technology, the advisers do discuss low and deficient grades with their students, not from the standpoint of reprimanding the student in any way but for the purpose of finding out the reasons for the low grades, and

what steps can be taken to remedy the situation. Both schools, through the adviser system, hope to get a little more personal contact with the students and to show them that the faculty is interested in what they are doing. The advisers also help irregular students assigned to them in arranging their schedules. The advisers are in no way considered as disciplinarians.

The method of handling student absences at Michigan State College is as follows: One faculty member is appointed as excusing officer for the whole college. If the student receives over eleven unexcused absences in any one term he is given a negative credit, twelve hours of work are required for one credit; therefore, if over eleven unexcused absences are accrued, the negative credit is given. If the student's absences are excused he is given the privilege of making up the work he missed. A slip is given the student to present to his instructor if the absence has been excused. Each instructor reports his absences once a week on the following type of report blank.

- | | |
|------------------------------|------|
| Name of Instructor | Date |
| Subject and Number of Course | Hour |

[illegible]

At the General Motors Institute of Technology absences are reported daily in key classes and continued absences are reported in all classes. There is no excusing of absences and the students are required to make up all work missed. The absence record is kept in the personnel office and absences go on the student's permanent record and are also sent to the co-operating company along with the grade report each month.

Another point of difference which has a large bearing on the way students are handled, is that at Michigan State College students are considered simply as students. At the General Motors Institute of Technology the students are primarily employees of the corporation. This being the case, the General Motors Institute of Technology has no employment problems at the end of the course due to the fact that the student having worked for a certain company during the four years has made a place for himself if he is the type of man desired by that company. However, if he is not the type of man desired by that company they have the privilege of terminating his training with them at any time during his course. Under this system the average employment problem which exists for most of the graduates of ordinary colleges is eliminated.

CHAPTER VI

A comparison of the curricula of two Engineering courses given at Michigan State College and the General Motors Institute of Technology is given below.

Administrative Mechanical Engineering at Michigan State College vs Industrial Engineering at the General Motors Institute of Technology.

FRESHMAN YEAR

Michigan State College	The General Motors Institute of Technology
General Chemistry	(Chemistry
English Composition	Science (Physics
Drawing (Mechanical	Engineering English
(Descriptive Geometry	Engineering Drawing
Mathematics (Algebra	Mathematics (Algebra
(Trigonometry	(Trigonometry
(Analytical Geometry	(Analytical Geometry
Shop Work (Pattern Work	Shop Work (Pattern Shop
(Foundry	(Machine Shop
(Machine Shop	
General Engineering Lectures	Practical Mechanics
Military Science	Co-ordination
Physical Education	

SOPHOMORE YEAR

Mechanical Drawing	Machine Design
	Tool Design or Die Design
Mathematics (Calculus	Mathematics (Analytical Geometry
	(Calculus
Physics	Physics
Shop Work (Pattern Shop	Chemistry of Metals
(Forge	
(Foundry	Machine Shop
Metallurgy	Engineering English
Surveying and Leveling	Industrial Development
Fundamentals of Speech	Factory Organization
Military Science	Co-ordination

JUNIOR YEAR

Mechanics	Mechanics
Thermodynamics	Heat treatment and
Paner Laboratory	Testing
Kinematics	
Steam Power	Advanced Machine Design
Accounting	Economics
Machine Shop	
Heat Treatment of Corbin Steel	Industrial Engineering EM5
General Economics	Industrial Engineering EM6
Resistance of Materials	Engineering English (Speaking)
Materials Testing Laboratory	
Gas Power	Co-ordination
A.C.Machinery	
Statistics	

SENIOR YEAR

Industrial Management	Elements of Electrical Engineering
Machine Design	
Seminar	English Literature
Heat Treatment of Alloy Steel	Accounting and Cost
Power Laboratory	Control-Budgetary control
Direct Current Machinery	Psychology
Heating and Ventilating	Industrial Engineering
A. C. Machinery	Industrial Engineering Problems
Labor Problems	Business Law
Public Utility Economics	Co-ordination
Contracts and Specifications	Equipment Design
Technical Problems	Graphical Presentations and
Corporation Finance or	Solutions
Investment Banking	

In comparing the courses offered during the freshman year we note from the above list that they are much more similar than one would suppose. About the same ground is covered in mathematics. In science we find chemistry in both lists. At the General Motors Institute of Technology, physics is started during the freshman year. About the same English is given at both institutions. In drawing we find mechanical drawing and descriptive geometry in the Michigan State curriculum whereas the mechanical drawing runs the whole year at the General Motors Institute of Technology. In shop work we find the foundry missing at the General Motors Institute of Technology with

more machine shop in its place. The foundry information which is felt necessary for the course at the General Motors Institute of Technology is incorporated in lectures in other courses and trips to the plants. In the Michigan State College curriculum we find General Engineering Lectures listed. To take the place of these at the General Motors Institute of Technology Practical Mechanics and Co-ordination courses are given. Military Science is listed for Michigan State College but not for the General Motors Institute of Technology. Physical education is another course given at Michigan State College and not listed in the curricula at the General Motors Institute of Technology, although regular periods are set aside for each section for gymnasium work.

In the sophomore year we find that in the place of mechanical drawing given at Michigan State College, machine design and tool or die design is given at the General Motors Institute of Technology. The mathematics courses are similar, calculus being given at both institutions and in addition to this analytical geometry is given at the General Motors Institute of Technology, which means that there is probably not quite as much calculus given at the General Motors Institute of Technology as at Michigan State College. Physics is given at both institutions while metallurgy is given at Michigan State College and chemistry of metals at the General Motors Institute of Technology. The shop work during this period at Michigan State College consists of pattern, forge, and foundry work while at the General Motors Institute of Technology it is machine shop work which makes two full years of machine shop work at the General Motors Institute of Technology. This is considerably more machine shop work than that given at Michigan State College.

In the English courses we find fundamentals of speech offered at Michigan State College and engineering English at the General Motors Institute of Technology. Surveying and leveling as given at Michigan State College is missing from the General Motors Institute of Technology program while industrial development and factory organization courses take its place. Military Science which is given at Michigan State College is not offered at the General Motors Institute of Technology; however a co-ordination course is given at the General Motors Institute of Technology which is not given at Michigan State College.

During the junior year we find mechanics given at both institutions. Kinematics is offered at Michigan State College while advanced machine design which consists largely of kinematics is given at the General Motors Institute of Technology. Heat treatment of carbon steel, resistance of material and materials testing are offered at Michigan State College while heat treatment and testing takes their place at the General Motors Institute of Technology. No English is offered during the junior year at Michigan State College while at the General Motors Institute of Technology engineering English in the form of effective speaking is given. Economics is offered at both institutions. The other courses offered during the junior year at Michigan State College are; thermodynamics, steam and gas power, A.C. machinery, accounting, statistics and machine shop while in place of these at the General Motors Institute of Technology two industrial management courses and a co-ordination course are given.

In the senior year A.C. and D.C. machinery is offered at Michigan State College while Elements of Electrical Engineering is

offered at the General Motors Institute of Technology. Industrial management and labor problems at Michigan State College corresponds closely to Industrial Engineering and Industrial Engineering problems given at the General Motors Institute of Technology. The machine design given at Michigan State College is replaced by equipment design at the General Motors Institute of Technology. While heat treatment of alloy steels, power laboratory, heating and ventilating, and technical problems are offered at Michigan State College, a course in graphical presentations and graphical solutions is offered at the General Motors Institute of Technology. Opposite the public utility economics, contracts and specifications and corporation finance or investment banking offered at Michigan State College we find accounting and cost control-budgetary control, psychology and business law given at the General Motors Institute of Technology. Lastly we notice that in place of the seminar course at Michigan State College co-ordination is given at the General Motors Institute of Technology.

The other comparison which we shall make will be a comparison of the Technical Automotive Engineering course given at Michigan State College and the Automotive Product Engineering course at the General Motors Institute of Technology. Since both of these courses, falling under the Mechanical Engineering head cover the same work during the first two years as the Administrative and Industrial Engineering course just compared this comparison will start with the Junior year.

JUNIOR YEAR

Michigan State College

Mechanics
Thermodynamics
Power Laboratory
Kinematics
Machine Shop
Steam Power
Gas Power
D.C. Machinery
A.C. Machinery
Resistance of materials
Materials testing laboratory
Machine Design
Heat Treatment of carbon steels

The General Motors Institute of Technology

Mechanics
Heat Engineering (Thermodynamics)
Engineering English
Elements of Economics
Automotive Engineering
Composition of materials
Advance Machine Design
Heat treating and testing
Co-ordination

SENIOR YEAR

Industrial Management
Machine Design
Heat Treatment of Alloy Steels
Power Laboratory
Heating and Ventilation
Outline of Hydraulics
Contracts and specifications
Technical problems
Seminar
Options:-
Automotive Engine Design
Auto Chassis Design

Automotive Engineering
Automotive Design
Automotive Laboratory
Elements of Electrical Engineering
Elements of Accounting and Costs
Principles of psychology
Co-ordination
Engineering English

In comparing the courses given in the junior year we note that mechanics and thermodynamics are given at both Michigan State College and the General Motors Institute of Technology. Advanced machine design at the General Motors Institute of Technology takes the place of the kinematics and machine design given at Michigan State College. Materials testing and heat treatment of carbon steels at Michigan State College is replaced by heat treating and testing at the General Motors Institute of Technology. Resistance of materials is given at Michigan State College while composition of materials is given at the General Motors Institute of

Technology. Power laboratory, steam power, gas power, A.C. and D.C. machinery are other courses offered at Michigan State College while automotive engineering, elements of economics, engineering English, and co-ordination are offered at the General Motors Institute of Technology.

In the senior year at Michigan State College machine design, automotive engine and chassis design take the place of automotive engineering, automotive design, and automotive laboratory at the General Motors Institute of Technology, while heat treatment of alloy steels, power laboratory, heating and ventilation, outlines of hydraulics and technical problems at Michigan State College replace courses in elements of electrical engineering, principles of psychology, and engineering english at the General Motors Institute of Technology. In place of contracts and specifications and seminar offered at Michigan State College, elements of accounting and costs and co-ordination are offered at the General Motors Institute of Technology.

As a general rule in both of the courses compared above we find the subjects taught in the two schools very similar, the main difference being in the year that the subjects are given. Some subjects given in the senior year at Michigan State College are given in the junior year at the General Motors Institute of Technology, etc. In the technical course we find more design work offered at the General Motors Institute of Technology than at Michigan State College. A few subjects are offered at Michigan State College that are not offered at the General Motors Institute of Technology and visa versa due to the slight differences in the gen-

eral programs and objectives of each course. The main difference will be found in the content of individual subjects taught.

C H A P T E R VII

A comparison of the methods of teaching various subjects at the regular college and at the General Motors Institute of Technology is given below.

First let us consider the subject of accounting. Should it be included in the engineering curriculum? Not so long ago debits and credits were words seldom used in other than the vocabulary of bookkeepers. Today we see decided changes. Even the name of engineer suggests a different idea than it has in the past. In the past the engineer was one who harnessed nature's power, built bridges, designed complicated machines, etc., but today we find engineers as chief executives of large companies. We find large companies giving their officials such titles as Engineer-Accountant and Sales Engineer. We might say that engineering is primarily management. Under management we consider such terms as sales, design, production, construction, finance, purchasing, and control. These terms are very important to the engineer, for the engineer who is most valuable to his company is one who in designing looks ahead to such things as cost of construction, production, and sale of the product. All of these points must be at all times before the eyes of the successful designer. He must see to it that the results of his work will show a profit on the books and records of his company.

Under the head of accounting falls costs, cost control, records, etc., and as these things affect the engineer materially in his work, they should be included in his training.

At the General Motors Institute of Technology the accounting course varies from that of the ordinary college in that the same ground is covered in two months in general accounting as in the ordinary college in one year. This means that many topics are not gone into so deeply. After the first two months cost accounting occupies the entire time. The course has three objectives: first, to acquaint the student with the fundamental accounting operations to arrive at a Balance Sheet and Statement of Profit and Loss; second, to consider the principles of cost accounting and give some practice in handling a cost system; third, to consider some of the more important uses of records. While the ordinary college accounting course is taught as such, it is taught largely with respect to costs, cost control and managerial use at the General Motors Institute of Technology.

Next we shall make a comparison between the machine shop work offered at the co-operative and non-co-operative engineering college. In many cases we note that the co-operative college has more shop equipment and also that what they have is more up to date than that of the ordinary college. This is brought about largely by the fact that many students work in the shops during their work period where the latest equipment is available. It is desirable that the student receive instruction on these machines; hence keeping the equipment up to date is one of the main factors at the co-operative engineering college. The machine shop course given at the General Motors Institute of Technology endeavors to give the student a basic fundamental training so that if necessary he will be able to work as a mechanic; in many other engineering colleges merely an introduction to this fundamental training is given. A very complete machine shop course gives a co-operative school good terminal facilities. Many

sophomore who have found it necessary to leave school at the end of the sophomore year and have had a complete machine shop course are working as tool makers. Training of this nature also makes the student of some value to the plant during his work period. A list of the operations which the student must complete at the General Motors Institute of Technology are given below.

PLANE AND DRILL

1. Chip Block
2. File Block
3. Scrape Block
4. Layout and Fit
5. Study Constr. and Operation
Drill Press
6. Grind Drill to Plug Size
7. Drill and Ream
8. Drill and Counter Bore
9. Drill and Tap

SHAPER

1. Study Constr. and Operation
2. Shape Parallel or Square
Surfaces
3. Align Vise and Work
4. Shape Vertical Surfaces
5. Shape Angular Surfaces
6. Shape Irregular Surfaces
7. Slotting or Cutting Keyway

LATHE

1. Study Constr. and Operation
2. Center and Face
3. Turning on Centers
4. Knurling
5. Turning to Shoulder
(Square or Radius)
6. Taper Turning (Tail Stock)
7. Taper Turning (Taper
Attachment)
8. Threading (External)
9. Chuck work (True and Face)
10. Chuck Work (Drill and
Ream)
11. Chuck Work (Boring)
12. Turning on Arbor
13. Threading (Internal)
14. Steady Rest (Turning or
Boring)
15. Turning Angles

MILLING MACHINE

1. Study Construction and Operation
2. Plain Slab Milling
3. Sawing or Slitting
4. End or Vertical Milling
5. Angle Milling
6. Drilling and Boring
7. Fluting Straight
8. Fluting Spiral
9. Gear Cutting (Spur or Spiral)
10. Gear Cutting (Bevel)

GRINDING MACHINES

1. Study Machine and Wheels
2. Dressing and Mounting Wheels
3. Plain Cylindrical Grinding
4. Taper or Angular Grinding
5. Grind to Shoulder
6. Surface Grinding (Square or
Angular)
7. Internal Grinding (Straight)
8. Internal Grinding (Shoulder or
Taper)
9. Tool and Cutter Grinding
(Plain)
10. Cutter Grinding (Spiral)
11. Cutter Grinding (Side or
Angular)
12. Cutter Grinding (Form)

PLANNER

1. Plain or Angle

SCREW MACHINE

1. Chuck work
2. Bar Work

A great many of the operations shown above are given the student as actual work which comes in from many plants to be turned out at the school. This gives the student the same experience out of a more practical nature than the project which is usually used in most colleges. In comparing the amount of machine shop work offered at various institutions we may state that of all students transferring from other colleges to the General Motors Institute of Technology after having completed the shop work at the other colleges, have been given a maximum of thirty percent credit for the work done at the other school.

Next in way of comparison we shall consider the subjects of chemistry and physics. At the General Motors Institute of Technology, the chemistry and physics courses vary in certain respects from the way it is presented in the ordinary college. Here fewer laboratory jobs are given. An attempt is made to get away from generalities and substitute more specific discussions. Subject material is selected with respect to shop work. Students are trained more, particularly in handling of engineering material rather than analytical chemistry. Lesson sheets with shop applications supplement the text material. In the course Chemistry of Engineering Materials, moving pictures and lectures from shop men supplement text material.

In comparing the pattern making course given at the General Motors Institute of Technology with the pattern making course given in the average college we note that while the ordinary college gives the student practical experience in the making of patterns and quite a bit of lecture work and some experience in foundry practice, the General Motors Institute of Technology gives very little practical

work in the making of patterns but gives about all academic work and tries to present pattern making as a trade and show its relation to other metal trades. As many students are destined to be future plant executives, an attempt is made to correct an impression which so many executives carry. For this reason they are shown that it is not as easy to make a pattern as it looks.

In comparing the study of economics at the General Motors Institute of Technology with the way it is taught in the ordinary college we find that the economics offered at the General Motors Institute of Technology is condensed. In other words about one month is allotted to each of the following topics: principles of economics, land and labor, money-banking and finance, organization of business, modern economic problems, and statistics. While at most colleges each of these topics is considered as an individual subject and about one term to each is allotted. For this reason it is impossible to give all of them in the engineering course. Outside speakers are brought in at intervals to speak to the class along the lines in which the speakers are experts. For example, when the class is studying insurance an expert on insurance is called in to speak on the subject. In this way the text work is supplemented and an interest factor is added. The main difference, however, is that at the General Motors Institute of Technology an attempt is made to give the student a broad conception of economics while most other colleges take certain phases of the subject and study them in detail.

The next subject which we shall consider by way of comparison is Mathematics. About the same differences apply in the several branches; college algebra, trigonometry, analytical geometry, and calculus. In this subject no great variations are found in the

way it is handled. The main difference, however, is that at the General Motors Institute of Technology a few topics are omitted which are not considered of great importance and more specific problems on certain of the more important topics are given. In this way there is a closer relation established between theory and application. An attempt is made to make as many of the problems as possible have a practical application.

C H A P T E R VIII

In comparing the effect on the student of continuous or periodic training we at the present time have no proof that one is superior to the other. There are, however, convincing arguments for both sides. Many believe that the most efficient method of instruction is the continuous one. They say that if there is a break in the training it takes the student some little time on returning before he will be able to proceed efficiently from the points where the work was dropped. They think it necessary that a certain amount of review must be given in order to get the student back into the receptive mood, and his mind cleared up on what has gone before in the course. On the other hand others say that no attention need be paid to the break in training, that when the student returns to school the work should progress just as though the break had been from Saturday until Monday. Many believe the break in training (when accompanied by co-operative work in the plant) to be very beneficial, for it very often happens that students in the plant have the opportunity to make use during the work month of some of the training they have had during the previous school month. This helps the student to see the direct application of his work and on return to school attack it with new interest and vigor which enables him to get much more out of it than he could if the course had been given with continuous instruction rather than periodic.

Another very important feature of the break in training made use of in the co-operative college is the fact that the work period

gives the student time to relax and rest after a period of strenuous study. Due to the fact that co-operative work takes part of the year which could be spent in the college a heavier load must be carried by the student during his school periods if we expect him to receive about the same amount of instruction which the student in the ordinary college would get. Most students would not be able to stand up under the extra strain of this heavier schedule if it were run on a continuous basis, but by use of periodic school and work periods which give the student time to relax the average student carries the heavier load while in school very nicely.

The records at the General Motors Institute of Technology would indicate very little if any difference in the grade of work for students co-operating on the four and eight week basis. One instance, however, might be cited which may indicate the advisability of periodic training if the periods are not too long. Some time ago at the General Motors Institute of Technology, one of the plants which employs a rather large number of students made the request that these students be allowed to stay in school for several months and then work several months in succession. This was done and the records for this particular group of students show average work for the first two months and then a general slump in the grade of work of the group. The work of this particular group would indicate that with a heavy schedule the student would do better on the periodic basis than on the continuous basis.

CHAPTER IX

There is undoubtedly a distinct place for both the ordinary and the co-operative type of college. In preparing himself for any one of a large number of walks of life a student would be by far better prepared for his job if he spent nine months a year for four years in college in the industrious pursuit of a course of study which is designed to give him certain worldly information which will be of use to him when he comes in contact with the material elements of his chosen profession.

Now let us on the other hand consider the co-operative type of education as preparation for an industrial position. In industry experience is a great aid and often times necessary for constructive work and advancement. When in the co-operative program, the students get this much needed actual experience. He has contact with the men in the shop under working conditions and faces their problems, and soon learns their feelings, and what they expect and what expected of them. Upon graduation after four years of alternate study and work he has gained considerable experience. In addition to having covered practically the same courses in school as the ordinary college student, the co-operative student has a decided advantage in the four years of practical shop experience. In other words the co-operative college student has in the minds of many a four year start on the ordinary college student when he starts working upon the completion of his course for it will take the ordinary college student nearly four years to gain the experience which the co-operative

student has upon graduation.

In addition to this the co-operative student, shifted as he is from one job to another to give him a broad experience, has a chance to work in a number of different lines of work and see what he is adapted for and which he likes best. This is often a great help to him in selecting his life's work. This selection usually comes much sooner for the co-operative student than for the ordinary college student. This fact alone gives one the advantage of several more years of experience in his profession at a certain length of time after graduation which oftentimes proves very lucrative.

We do not mean to say that the ordinary college student does not make industry a good man or that he does not have a good chance in industry, but we do wish to bring out the point that the student going into certain types of industrial work upon graduation from a co-operative school would have a better chance for quicker advancement than the same student graduating from an ordinary college.

As a summary of the above comparison of the products of the two types of schools we might say that in some positions and walks of life the ordinary college training would be far superior to the co-operative while on the other hand for some professions or trades, particularly industrial, the co-operative training is in many ways superior to the ordinary college training.

In addition to the above we might say that we believe that co-operative education is superior to ordinary college education in the teaching of human relations. This comes through contact with men while at work. As the students are changed from place to place

following a work schedule they work alongside many types of men on the various jobs, and not only do they have the opportunity to observe these types of men but also they may observe how the various groups of men are handled. Incidentally we note that many of the larger corporations which engage a number of college men each year feel the lack of both practical experience and experience in human relations in these men, for they have a certain training program which these college men must go through to gain these experiences, before they can be placed in responsible positions.

CHAPTER VI

The field of education is by far much larger for the ordinary college than it is for the co-operative college. This is true due to the fact that the co-operative colleges are largely limited to operation in industrial communities. For example, in sections of the country where agriculture and stock grazing predominate we would hardly expect to find a flourishing co-operative engineering college due to the lack of sufficient working places for the students and also to its location in a thinly populated section of the country. However, we believe the co-operative field of education an expanding one. Undoubtedly in the near future we shall see many fields of occupation aided by co-operating colleges which we at the present time do not even consider as possibilities.

At the present time, however, considering the colleges now in operation it is our belief that if a student expects to go into an industry in which there is a great amount of knowledge and skill in use that he would be farther along in a given time by attending a co-operative college which would give him training at the same time he was acquiring some of this knowledge and skill. If, however, the student expects to go into research or into other fields where such a great amount of practical knowledge would not be so beneficial when entering the field, then, the ordinary college could undoubtedly render that student a greater service than the co-operative college could hope to render.

CHAPTER VI

From a recent study made of the advantages and disadvantages of the co-operative plan we have made the following summary:-

Advantages to the student--Educational and Vocational.

For co-operative education

The relation of theory to practice is shown. The student is trained in the use of his knowledge. The co-operative plan provides systematic correlation between instruction in principles and practical training in their application. In this way interest and respect is obtained and consequently the learning progress is much more rapid. Many details which cannot readily be taught can be learned by observation in industry.

Industrial experience acts as a much needed steadying influence. The student learns to value things properly by looking at them as they are and he begins to appreciate the value of his education. Industrial experience develops the student's personality and strengthens his character. Often his resourcefulness and stamina are tested, his sense of responsibility is brought into play, self confidence and initiative are developed.

Against co-operative education

Many people say, (and in some co-operative schools it is true) that this is more of an assumed ideal correlation rather than an actuality. In many cases particularly in the early years of the course when the basic principles of science and engineering are taught there is not much chance of demonstration during the work period of the principles learned in school.

Students who work during vacations while attending the ordinary college are tested in this same manner but perhaps not to such an extent. It is difficult to prove that the ordinary college does not develop the student along these same lines altho probably not so readily as under guidance in the co-operative school.

For co-operative education

The student acquires a knowledge of one or more lines of work thru first hand experience. He is thus aided in choosing his field of work with some discrimination. Practical work is the best form of education and vocational guidance. Transition from college to practical life is prepared for and easily made upon graduation.

The student learns to appreciate the problems of the men he will subsequently oversee thru intimate contact in industry. He gets a better idea of labor problems and the reactions of the working man. The best time for a man to acquire the proper point of view in these respects is when he is still young. The graduate is not likely to have the inclination and possibly not the opportunity of doing so.

The student learns to get along with others, to work under supervision, to abide by decisions of his superiors and to follow instructions. Thus he is brought to the proper appreciation of the human factor in practical affairs and from the discipline of obeying instructions he learns to direct the affairs of others.

The student is brought face to face with the economic as well as the practical side of engineering. He learns business organization and management through actual observation. It is very difficult to teach such matters in the classroom.

Against co-operative education

Many say that colleges offering all resident courses are meeting the need of practical guidance through lectures, orientation courses, etc. Others say that the colleges have gone too far in this general way and that both students and graduates should be thrown upon their own resources in selecting their field of work. They say that the co-operative plan accentuates too much "combing".

Most people against the co-operative plan admit that this is a decided advantage of the plan.

This seems to be another strong point in favor of the co-operative school for there seems to be no argument advanced in favor of the ordinary college along these lines.

Those against the co-operative school say that the positions of most co-operative students are such that they are afforded little or no opportunity to observe these business principles and methods. The graduate, however, can learn these things in his introductory period in industry quite as

For co-operative education

Against co-operative education

well and he has a more mature mind which is more capable of grasping their importance.

The student learns up to date shop practices and methods.

He does not learn the fundamental principles or these up to date methods.

Advantages to the Student--Financial

For co-operative education

Against co-operative education

Due to the fact that students may earn most of the money necessary for school and living expenses, many may attend college whom otherwise would not feel able to do so.

A great majority of engineering students work during summer vacations and as the rate of pay for beginning co-operative students is small it is said that the all-resident student is just about as well off financially as the co-operative student. In addition to this most co-operative colleges are run on the five year basis instead of four and this lengthens the time by one year that the co-operative student must put in before he may seek full-fledged employment and financial independence. This point is very undesirable to many.

Advocates of the co-operative college education state that salaries of co-operative graduates are larger than those of all-resident graduates.

At the present time data collected shows that this statement is true immediately after graduation and for the next few years, but there is no basis of comparison on an equal footing of earning power at given times and this statement will not be considered seriously until such a comparison is made.

For co-operative education

In the co-operative college the student establishes a demand for his services. In many co-operative colleges the students have jobs when they graduate. In most instances it is easier to place a co-operative student than an all-resident student.

By spending a portion of his time in the shop before graduation his period of apprenticeship after graduation is shortened and therefore his promotion is more rapid.

Against co-operative education

This statement also is not supported by facts. The demand for graduates of all-resident schools exceeds the supply.

The cooperative states that graduates of all-resident colleges are just as far from his organization one year after graduation as the co-operative student is upon graduation. At this time both are the same age as the co-operative student referred to were on a five year schedule. (The above statement undoubtedly refers to co-operative students in institutions where the co-operative work does not start until the third year).

Advantages to the Institution and Faculty

For co-operative education

With given facilities and staff a greater number of students can be accommodated. The size of shops and laboratories can be reduced. In this way the cost per student is reduced.

Against co-operative education

If the cost of instruction is less in the co-operative school, the student either does less work or the teachers do more without an increase in compensation. Observations indicate that the latter is usually the case. Overhead expenses such as building upkeep, administration, etc. are less for the co-operative school but on the other hand this saving is offset by the fact that the co-operative school must maintain a staff of co-ordinators. The one matter of great economic importance, however, is the fact that the investment in in buildings and equipment is reduced.

For co-operative education

The co-operative student is more critical of the work of his instructors, for he has had a chance to put into practice many of the things being taught him. This makes the instructors feel the need of keeping abreast with the times and not getting into a rut. There is also more of a tendency for the instructor to give his best because he feels the students are more interested than they would be if they had not had the opportunity to be in contact with industry.

The close relationship which must be maintained between the institutions and industry affords a mutual appreciation of educational and industrial problems and this is a great help to the college.

Advantages to Industry

For co-operative education

Industry is afforded the opportunity to try out its students, and observe their character and abilities so that those best suited may be selected for permanent employment.

In many cases co-operating students have been placed with small concerns which do not see the necessity of employing engineering graduates or a technically trained staff. These firms are thereby directed to the

Against co-operative education

To offset this additional interest the faculty must repeat the instruction for alternating sections. This often times becomes monotonous and has a tendency to let the instructor get into a rut. One of the serious objections of the plan is that the staff is engaged in actual teaching practically the whole year or at least eleven months of the year and this affords the instructor very little opportunity for independent study or research work.

Contracts through research carried out for the benefit of industry and through teaching staffs who serve in consulting capacities give equal opportunities for this close relationship. These activities are almost impossible now, under the pressure of the co-operative system.

Against co-operative education

Is there not the danger in this that the industry may forget the welfare of the student and think only of itself. The advantage to the student must be remembered.

This same thing is continually going on although the co-operative plan is not the entering wedge.

For co-operative education

benefits of these things and therefore gain from the results of engineering education.

Against co-operative education

The co-operative engineering graduate seems to fill a spot in industrial organizations which was difficult to fill by graduates from the all-resident colleges. Industry has found it much more difficult to obtain competent personnel for the operation of plants than it has competent designers. The co-operative engineering work furnishes the desirable background for the executive work.

Will this training not make the student less competent on the strictly technical side of his work?

Disadvantages to the Student

Against co-operative education

In most instances the length of the course is increased thus the time at which the student enters productive employment is deferred.

For co-operative education

The student on the other hand produces and earns enough while he is in college to more than offset any disadvantage of deferred graduation. However, the length of the co-operative course is no longer than the all-resident course in many colleges.

As a general rule the work offered in a co-operative course (due to the characteristics of the program) must be highly concentrated, a larger class room load must be placed on the student. The concentration of the curriculum eliminates to a certain extent non-technical courses which many feel are of great value to the student.

These objections occur only with the way some of the co-operative institutions are conducted not all of them. These objections can be overcome by the proper handling of the plan as easily as in the all-resident courses.

Against co-operative education

Breaks in class work due to periodic instruction are very undesirable for proper educational results which are best reached through continuity of the learning process. The loss of the student's time due to the interruption in instruction is undesirable in that he must adjust himself anew to his studies each time he returns from his work in the plant.

The co-operative plan does not lend itself readily to participation in college activities which are a very important phase of college life. Many desirable activities cannot be maintained at all.

The student may come to think entirely of commercial success and forget cultural interests.

The co-operative plan being run on the eleven month basis as it is in most places gives the student very little time for vacations. At the best, the longest vacation of the complete five year program would afford the student who lives considerable distance away but a few days with his parents. The expense of the trip would in most of these cases be almost prohibitive considering the few days he would have at home. This is an objection which is made by both students and parents.

For co-operative education

These statements are incorrect as many teachers of the co-operative plan will testify. They say that the break in teaching affords a rest period for the student and he returns to his school work with new vigor and greater efficiency.

With the proper administrative arrangements athletics may be carried on without interference. The student's contacts outside the college are broadening sometimes even to a greater extent than those in the ordinary college.

This is hardly possible.

This will affect but a small number of students due to the fact that statistics show that all engineering colleges draw their students from a comparatively small radius. Students seriously affected by this phase of the plan need not enroll in it.

Against co-operative education

One criticism of strictly technical schools is that their students do not have the opportunity to make contacts with fellow students in other than technical courses. The co-operative plan still further emphasizes this deficiency. Much of the opportunity for the development of the student's social life is missing. The social contacts made are considered as one of the most important benefits derived from college.

There is a danger that the co-operative plan may exercise too much paternal control of the student. He may not be on his own resources enough to be well prepared for the outside world after graduation.

For co-operative education

Co-operative students enter just as fully into college life other than class room work as do all-resident students. In addition to this they have very valuable contacts within industry which assists a great deal in developing social poise.

This should not be the case and if it happens it should be guarded against. One advantage of the plan is that the students are separated from the supervision of the faculty periodically and are placed in industry where he soon finds that success depends entirely upon his own initiative.

Disadvantages to the College and the Faculty

Against Co-operative education

One of the things which may interfere with the success of the plan is that of the employment of students being interfered with during periods of depression.

There is seldom a choice on what kind of a job the student is placed on as the employing concern dominates that. Thus the college is not able to select those jobs providing the best experience.

For co-operative education

The co-operative plan has weathered such depressions.

These difficulties may be met by the college. Under proper organization, industrial experience may be made subordinate to educational aims.

Against co-operative education

A special group of co-ordinators must be employed to handle successfully the work of the co-operative system. These men in addition to the regular staff create additional expenses. Many administrative difficulties are caused by this plan.

In schools where there are all-resident students as well as co-operative students, it is difficult to correlate instruction as sometimes engineering students are enrolled in some of the sections along with the all-resident students in such courses as chemistry, English, etc.

It is impossible under the co-operative system to arrange teacher's vacations for other than very short periods and these at whatever time is most convenient in the program.

For co-operative education

The employment of a few co-ordinators is more than offset by the additional number of students accommodated. If the plan has merit, difficulties in administration are one of the minor considerations.

In such cases these subjects may be handled under the engineering department with a different faculty. If this is not practical the alternation of students in school and in industry may be put on the semester or term basis and in this way avoid conflict in scheduling students in sections with all-resident students.

This criticism applies only to the way the plan is conducted in certain institutions. The situation may be remedied under proper planning.

Disadvantages to Industry

Against co-operative education

The co-operative students is a liability to industry, actually costing industry money during his period in industry.

If a large number of colleges adopted the plan it would be impossible for industry to

For co-operative education

Even though the student does not at all times earn the wages paid him, the plan allows employers to obtain graduates better adapted to their organization and therefore they are glad to get co-operative students.

Approximately seventeen million persons are employed by American industries and compared with this

Against co-operative education

absorb all the students without seriously affecting its efficiency.

Some employers of the corporation employing co-operative students sometimes object. Those objecting are foremen and superintendents, due to the fact that they must break in new groups of students at regular intervals and this decreases the efficiency and upsets routine.

In some lines of work continuity of work and the continuous attention of the workman is essential. In those cases it would be impossible to have two students alternate on the job. Thus on jobs where they would obtain a wealth of experience it is impossible to use them.

For co-operative education

the number of co-operative engineering students is insignificant.

While this may be true when the system is first started these men will learn to adjust themselves to the plan and soon they have no objections to it.

This applies to such a limited field of work that this condition is not at all serious. When all such cases are subtracted there are still ample positions in which the student can get nearly all kinds of work and valuable experience.

CHAPTER VII

On the following pages are given examples of a work schedule of a plant employing co-operative students.

FOURTH YEAR PROGRAM

C.E.I.T

C.E.I.T	FOURTH YEAR PROGRAM	CO-ORDINATION REPORT	COMBINED SUBJECTS AT SCHOOL
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1. Good Workmen
 - a. Proper work habits
 - b. Energy
 - c. Attitude
2. Elementary knowledge of the product and department organization.
 - a. Purpose of units
 - b. Method of manufacture
 - c. Difficulties encountered in manufacture

He will be assigned to the shop as an operator on a variety of operations in three or more of the following departments:

- Starting motor assem.
- Starting motor parts
- Generator assem.
- Generator parts
- Distributor assem.
- Distributor parts
- Coil assem.
- Switch assem.
- Horn assem.
- Wiring harness assem.
- Foundry

- d. Department organization.
 3. First hand opportunity to become acquainted with the worker's viewpoints.

Report assignments are largely based on Objective #2. Each individual assignment will consist of one or a combination of several of the following subjects. They are to be considered in relation to the department in which they are assigned.

1. Department organization
 - a. Foremen
 - b. Assistant Foremen
 - c. Group Leaders
 - d. Number of groups and work of each.
 - e. Number of employees in department.
2. Description of the products and its purposes.
3. Rejections: Their causes and prevention.
4. Lay out of department showing flow of material and parts.
5. Description of special machines or processes.

Note: As the first year curriculum is largely basic, the correlation is not so pronounced as in the following year.

SCHEDULED WORK PROGRAM

G.M.I.T.

COMMUNICATION REPORT
SCHEDULED WORK
AT SCHOOL

COMMUNICATION

SCHEDULED WORK

A thorough knowledge of machine tools and machine tool operation as a basic foundation for Engineering training.

1. Organization and layout of department

2. Design and uses of machine tools, as

a. Engine lathe

b. Shaper

c. Milling machine

d. Grinder

e. Heat treat

3. Design and use of cutting tools

4. Gear cutting

a. Spiral

b. Bevel

c. Pinion

5. Die construction

6. Thread cutting

7. Design and layout of cams.

8. Heat treating

9. The effect of machine tooling on Industrial development.

10. History and purpose of this Department.

11. Description of special bench to be assigned.

12. Safety in the Tool Room.

13. The stock crib and its relation to the Tool room.

Engineering mathematics Elements of machine design

Tool and die design

Engineering science

Machine shop practice

Machine shop methods

Industrial development

Engineering English

Factory Organization"

"This course will serve as a preliminary survey of their work assignment for the Junior and Senior years.

DEFINITION OF STATUS AND OF SECOND YEAR

As the curriculum is so arranged that a profitable termination of training may be made at the end of the second year, each individual student is carefully studied at this time from the standpoint of the advisability of being placed on regular employment or of continuing the training for the two additional years.

If the student is to continue, an attempt is made to determine the probable field in which he will work when his course is finished. This decision is based on the aptitude and abilities of the student and the possible needs for trained men in the different fields.

The following work schedules for the third and fourth year have been approved by the various division heads as being the work course they would like for a student to pursue before being assigned to their division after graduation.

DIVISION		WORK SCHEDULE - THIRD AND FOURTH YEARS (listed in desired sequences)					
Production	Personnel	Time Study	Cost Acc'tg.	Inspection	Production	Tool Design	
Tool Engin.	Production	Time Study	Inspection	Tool Design	Plant Layout	Prod. Control	
Inspection	Production	Process	Time Study	Inspection	Engin. Lab.	Tool Design	
Prod. Control	Production	Plant Engin.	Tool Design	Process	Time Study	Cost Acc'tg.	
Process	Plant Engin.	Tool Design	Engin. Lab.	Prod. Control	Time Study	Production	
Time Study	Production	Inspection	Time Study	Prod. Control	Process	Cost Acc'tg.	
Cost Acc'tg.	Production	Production	Process	Tool Design	Time Study	Prod. Control	
Sales & Ser.	Engineering	Engin. Lab.	Process	Production	Inspection	Prod. Control	
Plant Engin.	Production	Plant Layout	Process	Plant Engin.	Personnel	Cost Acc'tg.	
Engineering	Production	Inspection	Tool Design	Cost Acc'tg.	Engin. Lab.	Service	

JUNIOR AND SENIOR YEARS PROGRAM

G.M.I.T.

COURSE	CO-ORDINATION REPORT ACHIEVEMENTS	CO-RELATED SUBJECTS AT SCHOOL
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WORK ASSIGNMENTS

1. To become more familiar with aims, organization and products of the Company.
2. To determine the type of work for which the student is best suited and to give him training in that field.
3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.

1. Organization and purpose of department
2. How are costs established.
3. Discuss the reasons why a given product may be moved from one department or plant to another and change the cost.
4. Discuss the relation of the Cost Dept. to our other divisions.
5. What is the Cost's Departments duties in regard to the annual inventory.
6. What are the qualifications of a good cost man.
7. Report on special assignments.

- Factory organization
Economics
Accounting and Cost Control
Industrial Engineering
English
Co-ordination

INSPECTION DEPT.

1. Organization and purpose of Division
(Industrial Engineering)
2. What is the relation between Inspection and the Engineering and Production Divisions
(Composition of materials)
(Elements of Electrical Engineering.)
3. What are the duties and responsibilities of an Inspection Supervisor
(Engineering Mathematics)
(Science)
(Heat treating and testing)
4. Discuss the policy of having resident inspectors
(English)
(Co-ordination)

5. Show the responsibility of the Inspection division on incoming material.
6. Discuss the design and manufacture of gauges.
7. Problems of the Ey-product division.
8. Report on special assignments.

OBJECTIVE

CLASS ASSIGNMENTS

CO-ORDINATION REPORT ASSIGNMENTS

RECOMMENDED SUBJECTS AT SCHOOL

1. To become more familiar with the aims, organization and products of the Company.

2. To determine the type of work for which the student is best suited and to give him training in that field.

3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.

PROCESS DEPT.

1. Organization and purpose of the department and trace its development.
2. Relationship of the Process Dept. to other divisions.
3. Discuss factors to be considered in the design of special machinery.
4. Process specifications.
5. Discuss the work of the Process Dept. relative to the use of new materials.
6. Qualifications of a good process man.
7. Report on special assignments.

INDUSTRIAL LAB.

1. Organization and purpose of department
2. Discuss this department's connection with the production and inspection departments.
3. Summarize the tests given one of the following products; Generators, Starting Motors, Horns, Distributors, Ignition Coils.
4. Discuss the work of this department relative to sales-samples.

Engineering mathematics
Engineering science
Machine shop methods
Machine shop practice
Machine design
Tool & die design
Composition of materials
Heat treating and testing
Industrial Engineering
Cost Control
English

Factory organization
Engineering mathematics
Engineering science
Elements of electrical engineering

Composition of materials
Heat treating and testing
English

OBJECTIVE	CHECK ASSIGNMENTS	CO-ORDINATION REPORT ASSIGNMENTS	CORRELATED SUBJECTS AT SCHOOL
		5. Operation of the record system. 6. Reports on special assignments.	

OBJECTIVE	WORK ASSIGNMENTS	CO-ORDINATION REPORT ANALYSIS	CORRELATED SUBJECTS IN SCHOOL
1. To become more familiar with the aims, organization and products of the Company.	INDUSTRIAL CONTROL	1. Organization and purpose of the Department 2. Discuss inventory turn-over 3. Discuss the tie-in-between the traffic, follow-up and purchasing departments. 4. Functions of the order department. 5. Discuss the functions of the material control department. 6. Discuss material handling and transportation. 7. Purpose of annual inventory 8. Methods of handling obsolescent material. 9. Report on special assignments.	Factory organization Industrial Development Economics Industrial Engineering English
2. To determine the type of work for which the student is best suited and to give him training in that field.			
3. To make sufficient contact with the executives and division heads so as to assist him in being properly placed at the end of his course.			
	PLANT ENGINEERING	1. Organization and purpose of the division. 2. Discuss our set up for buying utilities. 3. Discuss the installation of our power plant and its operation. 4. Outline the duties and responsibilities of the Maintenance Division 5. Discuss the advantage of driving machinery with individual motors rather than line shafting.	Factory organization Engineering mathematics Engineering science Drawing and design Industrial Engineering Composition of materials Elements of Electrical Engineering Engineering English Co-ordination

DESCRIPTION	FOR ASSIGNMENTS	CC-COPY WHICH REPORT ASSIGNMENTS	SCANNED SUBJECTS BY SCHOOL
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6. Enumerate the problems involved in the transmission of power by belts.
7. Discuss the factors to be considered relative to the location of a new plant.
8. Report on special assignments.

CONJUNCTIVE

OUR ASSIGNMENTS

CO-ORDINATION REPORT
ASSIGNMENTS

CONTAMINATED SUBJECTS
AT SCHOOL

1. To become more familiar with the aims, organization and products of the Company.
2. To determine the type of work for which the student is best suited and to give him training in that field.
3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.

FIELD STUDY

1. Organization and purpose of Dept. (Outline procedure.)
2. Taking time and motion studies
3. Discussion of our pay-ment plan.
4. Discussion of other pay-ment plans.
5. Advantages and disadvantages of our Group plan.
6. Relation of our wage payment plan to Costs.
7. Co-ordination of the Time Study division with other divisions.
8. Installation of a progressive line up from the standpoint of the Time Study Department
9. Report on special assignments.

THE NEW TOOL

1. Organization and purpose of the tool division
2. Layout and planning of new tools.
3. Relationship of the tool division to other divisions in the organization
4. Discuss our tool cost set up.
5. Discuss die design from the standpoint of types, material to be used, purpose, standardization and amount of product.

OBJECTIVE	WORK ASSIGNMENTS	CO-ORDINATION REPORT ASSIGNMENTS	CORRELATED SUBJECTS AT SCHOOL
		6. Discuss tool and machine design from the standpoint of standardization. 7. Report on special assignments.	

OBJECTIVE	WORK ASSIGNMENTS	CO-ORDINATION REPORT ASSIGNMENTS	CORRELATED SUBJECTS AT SCHOOL
1. To become more familiar with the aims, organization and products of the Company.	PRODUCTION	1. Organization and purpose of Division	Factory organization
2. To determine the type of work for which the student is best suited and to give him training in that field.		2. Discuss the conveyor systems and flow of materials through this division.	Industrial development Industrial engineering
3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.		3. Discuss the use and types of products made in this division.	Cost Control
		4. Discuss machine load and its relation to the point system.	English
		5. Discuss the relation of the production division to the other divisions such as Engineering, Tool, Sales, Maintenance, Production Control and Personnel.	Co-ordination Note: Indirectly with most of the entire list of subjects.
		6. Discuss the duties and responsibilities of a production foreman.	
		7. Discussion of special machines and processes.	
		8. Report on special assignments.	
		1. Organization and purpose of Department	Factory organization Economics
		2. Trace the growth of Personnel work.	Psychology
		3. Discuss safety and our legal obligations in industrial disabilities.	Industrial Engineering Business Law
		4. Explain the steps necessary in getting a new worker on the payroll and on the job.	English
		5. Our training program	Co-ordination
		6. Our suggestion system	
		7. Report on special assignments	

OBJECTIVES

WORK ASSIGNMENTS

CO-ORDINATION REPORT ASSIGNMENTS

CORRELATED SUBJECTS AT SCHOOL

1. To become more familiar with the aims, organization and products of the Company.

2. To determine the type of work for which the student is best suited and to give him training in that field.

3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.

1. Organization and purpose of the Department
2. Discuss the relation of the Engineering Dept. to the Production, Inspection, Sales, Service and Tool divisions.
3. Trace a new part through the Engineering Department.
4. Discuss the Engineering Dept. relation to standardization.
5. Explain a generator, part by part, both electrically and mechanically.
6. Discuss the qualifications of a good engineer.
7. Report on special assignments.

- Engineering mathematics
- Engineering science
- Mechanics
- Drawing and design
- Machine shop methods
- Composition of materials
- Elements of electrical Engineering.
- Machine shop practice
- Factory organization
- English
- Co-ordination

SALES & SERVICE

1. Organization and purpose of department.
2. Discuss the United Motors service organization and show how Delco-Remy functions with it.
3. What is the Sales Department's relation to standardization.
4. Discuss our Service policies.
5. We want to sell the "AE Motor Car Company" a different model distributor because their present type is

- Elements of Electrical Engineering
- Industrial Engineering
- Design
- Psychology
- Factory organization
- Engineering English
- Co-ordination

OBJECTIVES	WORK ASSIGNMENTS	CO-ORDINATION REPORT ASSIGNMENTS	CORRELATED SUBJECTS AT SCHOOL
		no longer standard with us. Show step by step what you would do. 6. What are the qualifications of a good sales and service man and what are some of the problems confronting him? 7. Report on special assignments.	

CO-ORDINATION REPORT
AT SCHOOL

CO-ORDINATION REPORT

CO-ORDINATION REPORT

1. To become more familiar with the aims, organization and products of the Company.
2. To determine the type of work for which the student is best suited and to give him training in that field.
3. To make sufficient contact with the executives and division heads, so as to assist him in being properly placed at the end of his course.
1. Organization and purpose of the department.
2. Discuss the relation of the Layout Dept. to the Production, Plant Engineering, Tool Design and Time Study.
3. Make a layout showing all machinery and equipment for some new product.
4. Discuss conveyors giving different types and show the advantages of each.
5. A cast iron machining department is having trouble with dust. Eliminate it, design your equipment and explain.
6. In a four story building we are spending too much money handling materials. Design a conveyor to eliminate this and show savings.
7. Report on special assignments.

CO-ORDINATION REPORT

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CO-ORDINATION REPORT

By the completeness of the above work schedule we have attempted to show how a well planned work schedule of a plant employing co-operative students can be a great aid in giving the student a broad engineering education. It shows the correlation of many subjects.

CHAPTER XIII

One of the great engineers of today, C.F. Kettering, Vice President of the General Motors Corporation makes the following statements, which we take the liberty to use as the closing words of this discussion. "Experience, upon which so great a store is set in our practical affairs is, after all the result of hard knocks which teaches us the relation of things and in learning relationships we develop good judgment. Even in our engineering schools the work with books often loses touch with the practical application. It is merely transition and the boys know it. Had the teachers training the youth of the country, learned to correlate one study with others, and bring all together in ordinary life, they would find their graduates slipping gracefully into the current and swimming along more easily with it."

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