# NON-VOCATIONAL COURSE CONTENT IN <br> GRAPHIC REPRESENTATIONS 

## THESIS

# NON-VOCATIONAL COURSE CONTENT <br> IN <br> GRAPHIC REPRESENTATIONS 

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In partial fulfillment of the requirements for the Degree of Master of Science Colorado State College
of

Agriculture and Nechanic Arts Fort Collins, Colorado

August 1938



## ACKNOWLEDGETENTS

The writer wishes to acknowleage his appreciation for the cooperation given in making and reporting this study.

Gratitude is expressed to Dr. Gilbert L. Betts, Supervisor of Graduate Research in Education and to Professor J. B. Yingling, Associate Professor of Industrial Education, Head of Department of Industrial Education, Colorado State College, for their helpful suggestions and criticism of the study.

Appreciation is especially expressea to Mr. Claude H. Ewing, Waghburne Trade School, Chicago, Illinois, for his invaluable assistance in the preparation of this manuscript.

Grateful acknowledgement is also due to the late Dr. Charles R. Allen, formerly Educational Consultant Federal Board for Vocational Euioation, Washington, D. C. for his guidance and aid in tne selection and development of the problem.

Special mention and thanks are extended to my wife for the encouragement and valuable assistance which she gave.

He also wishes to acknowledge his obligations to the teachers, parents, and alumni of the Downers Grove, Illinois, High School who Iurnished the data needed for the completion of this study.
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## Chapter I

## INTRODUCTION

Liodern trends in education and the demends of every-dey life make it imperative that all courses included in a high school program be under constent revision. We cannot assume thet a course once valuable will alweys be valuable. Non-vocationel courses should be recognized as such end their content so organized.

The pupils who enroll in mechanical draving in the Downers Grove High School, Downers Grove, Illinois, do not, in most cases, engage in arafting occupations after they leave school; therefore, the course should be designed to meet their needs as pupils, perents, and citizens. The course, es it is taught at present, is designed to develop draftsmen. It has been orgenized to correlate with woodworking and metalworking, although many of the pupils do not enroll in these industrizl arts subjects. It is important thet the drawing work should be correlated with the school work which the pupils are doing; therefore, it should correlate with more subjects in the school curriculum.

Several men have made surveys for the purpose of determining the content of mechanical drawing courses ( $3,5,7,10,12$ ), and their findings indicate that the
addition of new content or a change of emphasis on parts of the old content is needed. This is evidence thet a change is needed in our present mechanical drawing courses. Some of the newer textbooks (2, 6, 8, 14, ) in mechanical drawing have included units which the writers consider to be of more value to the average citizen than some of the units in the old traditional courses. Some of these units deal with making charts, graphs, free-hand sketches, and maps.

The problem of discovering what should be included in a course of study is in the field of curriculum construction. Orgenizing a course in mechanical drawing brings the study into the field of industrial arts, and inasmuch as this course is to be designed for high school students, it becomes one in secondery education. An important basis in developing eny course of study is to make it fit the present and future needs of the individual. Although the needs of pupils are, in generel, about the same, it seems more advisable to discover the present and likely future needs of the pupils for whom the course of study is designed. It is upon this basis that the study was made.

Thus, the problem of this thesis is: A study of the uses made of different kinds of graphic representation by the citizens of a residential suburb of a large commercial and industrial city, using as a type, Downers Grove, Illinois, a suburb of Chicago, Illinois, for the purpose of establishing a non-vocetionel course in the high
school dealing with graphic representations.
The term "graphic representation" has been select-
ed rather than the term "drawing" because of the narrow meaning often given to the latter. Drawing is usually thought of as pertaining to mechanical drawing or artistic drawing or both, but it is not thought of as including charts, graphs, diagrams, maps, and sketches. According to the definition of drawing, as found in Webster's New International Dictionary (13), the term 1tself is broad enough to include everything that should be included. It states that "drawing is the art of delineation or of portrayal by means of lines." However, since this is not the meaning which the average person gives to drawing, the writer used the term graphic representation which will include all types of mechanical drawing as well as charts, graphs, diagrams, maps, designs, mottoes, and free-hand sketches of various kinds.

The basis upon which the non-vocational course will be established is the uses revealed from the study. The aim of the course 1s: to give the pupil training in reading and making the different kinds of graphic representations which the average citizen uses today. The writer is aware of the fact that there are other objectives for the usual mechanical drawing course (11), and, no doubt, some of these other objectives can be fulfilled in the course of study that is finally proposed. However, no attempt will be made to show how the other objectives can
be achieved in the proposed course.
In working out this problem the following questions must be answered:

1. What is graphic representetion?
2. How does the average citizen use graphic representation?
3. What are the different kinds of graphic representations?
4. What is the content thet comprises a course of study?
5. What should be the orgenization of the course of study?

The proposed course of study is presented in outline form. No attemot is made to set up methods by which the various units should be taught. Neither are any exercises or plates proposed, nor does the element of time required to present each unit enter into consideration.

In preparation for carrying on this study a review of similar studies was made. There are several closely related to it.

An investigation was made by Mr. F. W. Walsh in 1928 of the uses of mechanical drawing in every-day home ilfe (12). Through a questionnaire sent to perents he learned whether they performed daily, frequently, seldom, or never certain activities at home involving the use of mechanical drawing or a knowledge of it.

His study revealed that (a) laymen made general use of mechanical drawing end the knowledge that it involves; (b) there was a general lack of training in mechanical drawing, and a short course in mechanical drawing fundamentals should be offered to all students during the junior high school period; (c) mechanical drawing should be considered in the scheme of general education.

An analysis of home activities was carried on in the Denver Public Schools in 1923 (9) for the purpose of including in the various industrial arts courses training for these activities. However, this survey failed to include an analysis of activities involving any type of drawing. Their analysis did not result in a separate draw-
ing course, because they concluded drawing should be related to other school subjects.

The mechanical drawing occurring in eleven widely read magazines was enalyzed in 1929 by Mr. C. A. Rosell (10). The findings formed a basis for a course in mechanical drawing for persons not expecting to use such training for vocationel purposes. The following types of mechanical drawing were considered: machine parts, woodworking projects, sections of all kinds, and architectural drawings. It was also found that architectural drawings appeared in more of the magazines than did other mechanical drawings. From other parts of the study it was concluded that a nonvocational course should include a group of problems in orthographic projection showing views in relation to one another in various combinations of the top, front, and end views. Machine perts and woodworking projects should form a goodly portion of the problems. Assembly drawings and sectional views should be included in the course as well as construction of lines and dimensioning. In the architectural field the reading of drewings in plan form should be the chief objective.

This thesis showed in a scientific way the features or elements which should be included in the part of a course of study dealing with orthographic, or working drawings, and architectural drawing.

Industrial drawings contained in seven magazines which were read most frequently by junior high school boys
in four Ohio communities were analyzed in 1932 by Mr . A. M. Hoffmen (7). This study found that 65 per cent of the boys read a magazine which contelned industrial drawings on 28 per cent of its pages, while 55 per cent of the boys read another magazine which contained industriel drewings on 32 per cent of its pages. Also 65 per cent of these drawings were in orthographic projection, and 88 per cent of the drawings in orthographic projection were shop drawings. Of these shop drawings 70 per cent were included under the following four classifications: furniture, electrical, sheet metal, and machine drawings.

These findings show the need for an extended ana-
lysis of drawings appearing in literature for the purpose of organizing a broader course of study in drewing.

Five copies of newspapers and 15 copies of magazines were stualed by Mr. O. A. Hankamer (5) to determine the amount and kinds of drawing they contained. He found that 28.5 per cent of the newspaper and magazine space was given to drewing. From this study he concluded: (a) that drawing had enough appeal and instructional value to be given more serious consideration in textbooks, public school curricula, and general educational methods; (b) that the data seemed to justify the establishment of two types of courses in drawing, nemely: basic interpretative instruction for the rank and file of pupils end specialized courses with a vocational aspect; (c) that drawing instruction should be diversified as to types of draving
and that instruction should not be based on abstract exercises; (d) that all pupils have a need for the minimum understanding of graphic representation.

A study was made by Mr. W. P. Hale in 1932 "to determine, if possible, what should constitute the content of a mechanical drawing course designed to teach pupils how to read, understand, and how to make the drawings which they were most likely to meet or need in every-day ilfe." (3) He reviewed 102 newspapers, 60 magazines, 126 mailed advertisements, and 158 school library books to discover how frequently drawings occurred in them. He also tabulated the space taken by the drawings. Any type of graphic representations which were produced in a drafting room were considered as a drawing.

It was concluded that some form of drawing wes needed in nearly every walk of life, and as a daily experlence the majority of people need a knowledge of reading and understanding drawing. The kinds of drawing found to be important were: pictorial drawings, freehand sketching, orthographic projections, sections, mottoes and emblems, lettering, diagrams and charts, outdoor drawings, graphs, silhouettes, line maps, architectural drawings, geometrical constructions, wiring diagrams, developments, elevations, conventions, and patent drawings.

These studies have been based on parents' and pupils' use of drawings in home life, drewings found in magazines and newspapers, and the space drawings occupy in
newspapers, magazines, mailed advertisements, and school library books.

However, none of these include all three groups which are surveyed in this study, nor are all elements of the problem so definitely related to one community and its needs.

Attention is also called to the fact that six years of great industrial growth has elapsed since the last of these studies was made. During this time the need for a course, such as proposed, has become more evident.

To secure the deta needed for solving the problem, three groups of people were called upon. The first source was the parents of the pupils in the Downers Grove High School. Since the results of this study will be used to improve the curriculum in the high school it wos assumed that this group of people would be more wiling to cooperete by fumishing the data desired. Many of this group work in Chicago and Ilve in Downers Grove. Their occupations are as varied as one expects such a group to be. This is shown by the fact thet the group of parents used in the study geve their occupations as: 21 metalworkers, 16 building trades workers, 11 railroad employees, 9 off1ce workers, 8 electricel workers, 8 in retailing, 5 workers in the automobile industry, 4 mechanical engineers, 3 salesmen, 3 farmers, 3 tailors, 3 unemployed, 2 printers, 2 government inspectors, 2 housewives, and 1 each of the following: doctor, artist, professor, Janitor, nurserymen, truck driver, warehouse worker, fire protection engineer, and price engineer. Most of these people have reached the point in life where it would seem that they have already found a use for graphic representation if they are ever going to use it.

The second source of information was alumn who had atudied mechanical drawing some time during the years 1930-1938. It was assumed that these younger men would be more likely to read newer literature than the parents. The occupetions of this group are also veried: ll are at present attending college or technicel school--two of these 11 are employed part-time, one as a road man for the United States Geologic Survey and the other as a shop hand. Of the remaining 34, six are employed in some ine of electrical work, five work in machine shops, four are unemployed, and one each is employed as: embalmer, auto mechenic, mink rancher, nurseryman, inspector, gas attendent, assistant patrolman of highways, sheet metal worker, draftsman, grocery clerk, artist engrever, office clerk, aeronautical engineer, chemical engineer, reilroac worker, and surveyor's helper. They are more famillar with the present mechanicel drawing course, hence, are more likely to offer pertinent suggestions for the improvement of the course. Furthermore, they have had mechanical drawing, and, therefore, they are better able to recognize possible uses of drawing or graphic representation then a parent who has not had auch training.

The third source of data was the teachers in the sohool. These teachers are familiar with the ways in which the pupils have opportunity to make use of graphic representation in their classes and hobby clubs. The following 11st of school subjects taught by the teachers inter-
viewed inaicated a broad curriculum: English, French, Latin, Spanish, Current European History, World History, American History, Civics, General Mathematics, Algebra, Geometry, General Science, Biology, Chemistry, Physics, General Shop, Woodworking, Genersi Business, Boolkeeping, Typewriting, Commercial Law, Stenography, and Art.

The data were gathered from the parents and alumni by the use of a questionnaire; the same questionnaire was used for both groups. The data were obtained from the teachers by means of personal interviews.

The content of the questionnaire was developed from the findings of Hale's study (3), questions used by Walsh in his study (12), and other questions added by the writer. How frequently people use drawing room tools was a secondary consideration.

The method used in working out the larger part of the questionnaire was to make questions to determine how frequently the individual had occesion to read or make the different types of drewings which Hale found in his study (Chapter II, page 16). Because of Hale's detailed analysis there was an overlap;ing of terms, so that it became necessary to combine certain types of drawing before questions could be framed. For example: wiring diagrams were included with diagrams and charts with graphs. Outdoor drawings were omitted, because it was apparent that they were either pictorial drawings or iree-hand sketches. Geometrical constructions and conventions were omitted
because they were also parts of other types of drawing. Furthermore, it was apparent that data indicating how frequentiy people read certain simple types of drawing would be of little value in working out a course of study in graphic representation; because of their simplicity no training is necessary to read them. Therefore, no questions were asked to determine how often people read picture drawings, mottoes and emblems, lettering, or silhouette drawings. A total of 26 questions were developed from Hale's findings.

These questions were compared with the questions used by Walsh (See Appendix), and it was found that Walsh had five questions which gave uses of graphic representation which were not included in the questions based on Hale's study. These five questions were added to the questionnaire.

None of the questions so far was designed to learn how often the individuel uses the common drafting room tools. For this reason three questions were added to see how frequentiy the scale, $T$-square and triangles, and the ruling pen were used.

In order to make comparisons as to the extent of use of drawing between those people who had studied drawing and those who had not, each person was asked to indicate if he had had such training.

The final question concerned the occupation or means of Iivelihood. This information was presented to
show the variety of occupations in which the parents and alumni were engaged.

In its original form the questionnaire consisted of questions on each type of drawing. To answer these questions a check could be made to indicate whether they read drawings or made them. This original set of questions contained terms which laymen do not understand. As an exent ple the first question in the original questionnaire read:
"Check to what degree you make or read mechenical pictoriel drewinge such as: isometric, cebinet, oblique, or perspective.

| Read | Daily | Frequently | Seldom | Never |
| :--- | :--- | :--- | :--- | :--- |
| Lake | Daily | Frequently | Seldom | Never" |

The terms in this question were found to be too technical, so the question was revised to read:
"Do you ever make picture aramings in which you use a straight edge or other drewing instruments? (A picture drawing shows the object e.s it appears to the eye, similer to a photograph) D. F. S. N."
(See Appendix)
The preliminary explanation in the final questionnaire read:
"In ansvering these questions will you kindly indicate the degree of use you make of the different types of arewing by encircling the letter which best describes your use:
(D)-deily; (F)-frequently; (S)-seldom; (N)never"

In their new form the questions were simplified end limited so thet seperate questions were used to find out whether indiviauals read or mede each type of dreming. To help the respondents to understand the questions contein-
ing technical terms, simple sketches were included. In order to determine the degree to which any of these types of drawing was used a plan, similar to that used by Walsh in his questionnaire, was used. The person answering the questionnaire was asked to indicate the extent to which he used the drawings by checking the letters D. (daily), F. (frequently), S. (seldom), and N. (never).

In order to validate this questionnaire it was used as an outline for interviews with twenty people, and care was taken during the interviews to determine if each of the questions was understood. As already pointed out in the description of the way in which the content and form was worked out, it was found necessary to make some changes in the questions. After these changes were made and tested by additional interviews, the questionnaire was put in its final form. (See Appendix)

A random selection was made from the names of parents of all pupils in the high school. A total of 864 names were available after duplicate names were eliminated. These were placed on cards, and these cards were shuffled. They were then dealt out by placing the first three cards on one pile and the fourth card on a second pile. This dealing was continued until all the cards were divided into two piles. The pile with every fourth card contained the names of 216 parents. Twenty parents out of this group were interviewed, as previously mentioned, and the rest were sent questionnaires made up of the questions used in
the interviews.
Permission was secured from the principal and superintendent of schools to send the questionnaires home through the pupils. This was best done by asking the report room teachers to give out the questionnaires to those pupils whose parents had been selected and to try to have as many returned as possible. Out of 196 questionnaires sent out by this method 103 were returned. These with the 20 interviews made a total of 123 returns.

Questionnaires were sent by mail to all graduates, who could be located, and who had been enrolled in a courss in mechanical drawing in the high school during the last eight years. Out of 163 questionnaires sent out 45 were returned.

In order to develop the interview questionnaire to be used with teachers a list of ways in which pupils use drawings was obtained. This list was secured by asking the mechanical drawing pupils to list the various ways in which they use drawing in other school subjects. A copy of the list and the frequency of use of each item may be found on page 89 of the Appendix. Questions were constructed in order to discover from the teachers the extent to which pupils had occasion to use drawing in these different ways. This group of questions was compared with the questionnaire designed for parents and alumni, and wherever it was possible to do so without changing the thought, the questions which were alike were worded in the same way
in order that comparisons could be made in the results after the data were collected. A final question used in the teachers' questionnaire was planned in order to ind out whether graphic representations are being used in textbooks less, about the same, or more now than they were five or ten years ago.

When the parents' questionnaires were returned they were grouped into three groups: those who had studied drawing, those who had not studied it, and those who did not say. All the questionnaires were numbered consecutively by groups. The data from them were tabulated on master sheets. These were constructed to show horizontally the number of the questionnaire or interview and vertically the number of the question. (See page 90 of the Appendix)

These data were analyzed and the following criteria were applied to them to determine which types of drawing should be included in a proposed course of study: that if 25 percent or more of each of two out of the three groups replied that they used daily or frequently a certain type of drawing and that if in two groups of the three that same type of drawing ranked in the upper twothirds of the answers after they had been arranged according to values then that type should be included. The values assigned each degree of use were three for 'Daily', two: for 'Frequently', one for 'Seldom', and zero for 'Never' or any question not answered.

All of the types of drawing that satisfied the
conditions of the criteria were orgenized into a course of study.

## Chapter IV

RESULTS OR FINDINGS

In the presentation of the findings of this study it was necessary to consider several things which might be confusing to readers. Because of the difference in numbers of people included in the three groups interviewed percentages are used in reporting negative and affirmative onswers.

Some questions were not used in the teacher questionnaire. However, replies to those questions asked teachers are included with the replies received from the other two groups.

The findings of the study are presented in the order of the questions on the parent-alumni questionnaire, but the number of the question on the teacher questionnaire is also given.

Question 1 (No. 2 of the Teachers' Questionnaire)
was:
"Do you ever make picture arawings in which you use a straight edge or other drawing instruments?
(A picture drawing shows the object as it appears
to the eye, similar to a photograph.)"
The results may be found in Table 1.
Table 1.--FREQUENCY OF MAKING PICTURE DRAWIINGS MECHANICALLY

| Groups Interviewed | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequentiy |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{array}{\|l} \hline \text { Num- } \\ \text { ber } \\ \hline \end{array}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 116 | 6 | 5.2 | 40 | 34.5 | 38 | 32.8 | 32 | 27.5 |
| Alumn | 44 | 5 | 11.4 | 16 | 36.3 | 20 | 45.5 | 3 | 6.8 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 3 | 10.7 | 8 | 28.5 | 13 | 46.5 | 4 | 14.3 |

The replies to this question show that the siumni use and the pupils' use, as indicated by the teachers, were greater than the parents' use for this type of drawing. While there were only 6.8 per cent of the alumni and 14.3 per cent of the teachers that answered 'Never' to this question, there were 27.5 per cent of the parents who answered 'Never'. The percentage of alumni and teachers who gave 'Daily' as an answer to this question were almost the same--11.4 per cent for the former and 10.7 per cent for the latter. In these same two groups there was also a close correlation between the percentages of those answering 'Seldom': 45.5 per cent and
46.5 per cent respectively.

Question 2 (No. 1 of the Teachers' Questionnaire)
was:
"Do you ever make a free-hand sketch?"
The information secured is presented in Table 2. Table 2.--FREQUENCY OF MAKING PICTURE SKETCHES

| Groups Interviewed | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Da11y |  | Frequentiy |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 118 | 8 | 6.8 | 54 | 45.7 | 25 | 21.2 | 31 | 26.3 |
| Alumn | 45 | 4 | 8.9 | 20 | 44.4 | 16 | 35.6 | 5 | 11.1 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupilss } \\ \text { Use) } \end{gathered}$ | 28 | 2 | 7.2 | 12 | 42.8 | 9 | 32.1 | 5 | 17.9 |

The alumni indicated that they used this type of drawing to a greater extent than the other two groups. Whereas 88.9 per cent of them used it either 'Daily', 'Frequently', or 'Seldom', only 82.1 per cent of the teachers and 73.7 per cent of the parents indicated use made of it to some degree. The daily use indicated in answers to this question was about the same per cent for each source--parents 6.8 per cent, alumni 8.9 per cent and teachers 7.2 per cent. A similar close relationship existed for those answering frequently--the percentages being 45.7 per cent, 44.4 , per cent, and 42.8 per cent respectively.

## Question 3 was:

"Do you ever make a free-hand picture sketch in which you include dimensions? ${ }^{H}$

The parents and alumni responses are shown in Table 3.
Table 3.--FREQUENCY OF MAKING FREE-HAND PICTURE SKETCHES WITH DIMENSIONS

| Groups Interviewed | Totel Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Dally |  | Frequentiy |  | Seldom Never |  |  |  |
|  |  | $\begin{array}{\|l\|} \hline \text { Num } \\ \text { Ber } \\ \hline \end{array}$ | $\begin{aligned} & \mathrm{Per} \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { Ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \end{array}$ | $\begin{array}{\|l} \text { Num- } \\ \text { ber } \end{array}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ |
| Parents | 119 | 9 | 7.6 | 49 | 41.2 | 30 | 25.2 | 31 | 26.0 |
| Alumn | 45 | 4 | 8.9 | 12 | 26.7 | 24 | 53.3 | 5 | 11.1 |

A little over one-fourth of the parents indicated that they never made free-hend picture sketches in which they included dimensions, while a little more than onetenth of the alumni so indicated. About the same percentage of parents and alumni answered that they used this type of drawing 'Daily'--7. 6 per cent and 8.9 per cent respectively. More alumni(24) answered 'Seldom' to this question than they did to any other question. No comparison could be made between the teachers' replies and those of the other groups because this question was not included in the teachers' interview-questionnaire.

## Question 4 was:

"Do you ever read free-hend picture sketches which include dimensions?"

The data secured in reply are given in Table 4.
Table 4. --FREQUENCY OF READING FREE-HAND PICTURE SKETCHES WITH DIMENSIONS

| Groups <br> Interviewed | Total <br> Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Dally |  | Frequently |  | Seldom |  | Never |  |
|  |  | Number | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{array}{\|l\|} \hline \text { Num- } \\ \text { Ber } \end{array}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |  | $\begin{aligned} & \text { n+Per } \\ & \text { rect } \end{aligned}$ |
| Parents | 120 | 15 | 12.5 | 51 | 42.5 | 27 | 22.5 | 27 | 22.5 |
| Alumi | 44 | 2 | 4.6 | 21 | 47.7 | 16 | 36.3 | 5 | 21.4 |

Although almost three times as many parents as alumni read daily free-hand picture sketches which included dimensions, the results showed that the percentage of parents who never read this type of drawing was almost twice as great as the percentage of alumni. This was offset by the fact that a greater percentage of alumni read these drawings frequentiy or seldom.

Question 5 (NO. 3 of the Teachers' Questionnaire)
was:

> "Do you ever make a free-hand multi-view or orthographic sketch of objects? In this type of drawing the front, top and side views of the object are drawn separately.

The question was answered as shown in Table 5.

Table 5.-FPEQQUNCY OF HAKING FFEE-HAND ORTHOGRAFHIC SKETCHES

| Groups Interviemed | Total <br> Cases | Use Mace of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuentiy |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Perents | 120 | 6 | 5.0 | 40 | 33.3 | 41 | 34.2 | 35 | 27.5 |
| Alumi | 45 | 4 | 8.9 | 17 | 37.7 | 13 | 28.9 | 11 | 24.5 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupilss } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0 | 3 | 10.7 | 8 | 28.5 | 17 | 60.8 |

About one-fourth, 27.5 per cent of the parents and 24.5 per cent of the alumni, replied that they never made free-hand orthographic sketches, while more than onehalf ( 60.8 per cent) of the teachers saic that the pupils never had occasion to make them. Almost the same percentage of all three groups ( 34.2 per cent, 28.9 per cent, and 28.5 per cent respectively) seid that they made this tyoe of arewing seldom. None of the teachers indiceted a deily use in answer to this question.

Question 6 (No. 16 of the Teachers' Questionnaire) was:
"Do you ever read free-hand multi-view or orthographic sketches?"

The results follow in Table 6.

Table 6.--FREQUENCY OF READING FREE-HAND ORTHOGRAPHIC SKETCHES

| Groups <br> Interviewed | $\left\lvert\, \begin{aligned} & \text { Total } \\ & \text { Cases } \end{aligned}\right.$ | Use Lede of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Da.11y |  | Frecuentiy |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { Ber } \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l} \text { Per } \\ \text { Cent } \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent |
| Parents | 120 | 10 | 8.3 | 43 | 55.8 | 32 | 29.2 | 35 | 25.7 |
| Alumi | 45 | 6 | 13.5 | 18 | 40.0 | 10 | 22.3 | 11 | $2 \leq .4$ |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 7 | 25.0 | 7 | 25.0 | 14 | 50.0 |

In answering this question the tecchers were equelly divided, 14 of them indicating that the student never had occasion to read orthographic sketches, wile the other 14 indicated frequent or seldom use of them. The latter 14 were also equally diviced seven marking frequentIy and seven marking seldom. None of the teachers marked daily. Approximately 75 per cent of the parents and alumni read Iree-hand orthographic sketches to some extent.

Question 7 (Question 4 of the Teechers
Questionnaire) was:
"Do you ever make multi-view or orthographic
drewings by using $\varepsilon$, streight edge or other
drewing instruments? Such drawings might include
things which you intena to make or heve someone make for rou."

Table 7 shows the data secured.

Table 7.--FREQUENCY OF MAKING LECHANICAL ORTHOGRAPHIC DRAWINGS

| Groups Interviewed | $\left\|\begin{array}{\|c\|c\|} \text { Total } \\ \text { Cases } \end{array}\right\|$ | Use Liade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuently |  | Seláom |  | Hever |  |
|  |  | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | Number | Per Cent | Num- ber | $\left\lvert\, \begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}\right.$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | Per Cent |
| Parents | 121 | 7 | 5.8 | 46 | 38.0 | 33 | 27.3 | 35 | 28.9 |
| Alumni | 45 | 6 | 13.3 | 13 | 28.9 | 17 | 37.8 | 9 | 20.0 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 2 | 7.2 | 7 | 25.0 | 19 | 67.8 |

Parents and alumni mede orthographic draving by the use of instruments more frecuently then pupils dia in their school work. Only one-third of the teachers (32.2 per cent) indicated that the pupils used this type of drawing while 80 per cent of the alumi and 7l.1 per cent of the parents indicated sorue use. The sum of the percentages of parents thet used this kind of drawing frequently and seldom was practically the same as the.t of the alumni: 65.3 per cent $\varepsilon$ ne 66.7 per cent.

Question 8 was:
"Do you ever read multi-view drawings which heve been made with instruments? Weny such cravings which occur in magezines show how to meke pieces of furniture, cabinets, enci verious appliences."

The parents' anã alumni answers are presented in Table 8.

| Groups Interviewed | Totel Cases | Use Lisde of Dreving |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Dat1y |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent |
| Perents | 122 | 18 | 14.7 | 53 | 43.5 | 27 | 22.1 | 24 | 19.7 |
| Alumi | 44 | 8 | 18.2 | 22 | 50.0 | 6 | 13.6 | 8 | 18. 5 |

There was a very close relationshio between the answers of perents anci alumni for each of the four ciegrees of use. The greatest verietion wes about 7 per cent, end this occurrea both in 'Frequently' anc 'Selciom'. In the former, the alumn percentage was greater while in the letter the parent percentsge was greater. Aoout one-helf of the parents ( $\$ 3.5$ per cent) and alumni ( 50.0 per cent) soid they reac multi-view drewings frecuently. Over four-ifiths of both groups answered thet they read this type of drawing to some degree.

Question 9 wes:
"Do you ever use a drawing for the purpose of
assembling an article or machine?" assembling an erticle or mechine?"

The results may be found in Teble 9.

Table 9.--FPEQUENCY OE AEADING DRAMINGS FOA ASSEEBLTIG

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | Totel Cases | Use İEde of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuentiy |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Mum } \\ & \text { bem } \end{aligned}$ | $\begin{aligned} & \text { Fer } \\ & \text { Cent } \\ & \hline \end{aligned}$ |
| Perents | 120 | 23 | 19.4 | 44 | 36.5 | 26 | 21.6 | 27 | 22.5 |
| Alumn | 45 | 9 | 20.0 | 18 | 40.0 | 11 | 24.4 | 7 | 15.6 |

An even closer correlation existed between the replies of the parents and alumni for each degree of use then existed in the precedinc teble. Again the greatest veriation was 7 per cent, but this occurred only in one place, namely, in those checking 'Never'. Or the parents 22.5 per cent seid they never used drawings for assembling articles or machines while of the alumi 15.6 per cent answered in this way.

Question 10 (No. 5 oi the Teachers Questionnaire)
was:
"Do you ever make drawings in which there are sectional views (portions cut away to enable one to see the interior construction or to eid with assembling)?"

The answers are given in Table 10.

Table 10.--FREQUENCY OF ITAKING SECTIONAL VIEWS

| Groups Interviewed | Total Cases | Use mide of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Deliy Frecuentiy |  |  |  | Selcor |  | Tevar |  |
|  |  | bum | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{array}{\|l} \hline \text { Tum- } \\ \text { ber } \\ \hline \end{array}$ | Per Cent | $\begin{array}{\|l\|} \hline \text { Num- } \\ \text { ber } \end{array}$ | $\begin{array}{\|l\|} \hline \mathrm{Per} \\ \text { Cent } \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Num- } \\ \text { ber } \\ \hline \end{array}$ | Pe= <br> Cent |
| Parents | 122 | 9 | 7.4 | 34 | 27.9 | 26 | 21.3 | 53 | 43.4 |
| Alumis | 45 | 5 | 11.1 | 14 | 31.1 | 12 | 26.7 | 14 | 31.1 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils } \\ & \text { Use) } \end{aligned}$ | 28 | 0 | 0.0 | 2 | 7.2 | 7 | 25.0 | 19 | 67.8 |

A greater percentage of perents and alumi then teachers (pupils use) indicated that they made drawings With sectionel views. The elumni in 68.9 per cent of the cases mede this type of arawing most irequently as shown by the teble, while the parents made them in 56.6 per cent of the cases and the teachers in only 32.2 per cent of the cases. More people checkea 'Never' in their ansmers then eny other degree of use, and in the case or parents and alumi more people cheched 'Frequently' then they did 'Seldom'.

Question 11 wes:
"Do you ever read arawings containing sectionel views?"

The results are presented in Teble 11.

Table ll.--FREQUENCY OE READING SECTIONAL VIEWS

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | Total <br> Cases | Use liade of Draming |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily F |  | Freauently |  | Selcam |  | Hever |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \mathrm{Per} \\ & \mathrm{Cent} \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Perents | 122 | 25 | 20.5 | 36 | 29.5 | 33 | 27.0 | 28 | 23.0 |
| Alumni | 45 | 5 | 11.1 | 16 | 35.6 | 15 | 35.3 | 9 | 20.0 |

The percentage of perents who inciceted their
degree of use as 'deily' for this question vas elmost twice as great as the percentage of alumn who checked it the same way: 20.5 per cent as compared to 11.1 per cent. The daily use was checkeà by more parents for this question than for any question in the questionnaire. The answers of the parents to the other three degrees of use were closely related to those of the alumni. The greatest degree of difference was 6.1 per cent in the case of 'Frequently', in which the percente.ce or perents was 29.5 per cent and the alunni 35.6 per cent.

## Question 12 was:

"Do you ever make any mottoes or emblems such as are used in advertising, trade-marks, designs, stamps, medals, insignia, and the like?"

The information secured is presented in Table 12.

Table I2.-FREQUENCY OF HAKING VOMNOS AND EEIESS

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | $\left\|\begin{array}{c} \text { Totel } \\ \text { Ceses } \end{array}\right\|$ | Use waje of Dreming |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | De.11\% |  | Frequentiy |  | Selcom |  | Never |  |
|  |  | Num- | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { bex } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Fer } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { mum- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\left[\begin{array}{l} \text { Per } \\ \text { Dent } \end{array}\right.$ |
| Perents | 118 | 3 | 2.5 | 9 | 7.6 | 31 | 26.3 | 75 | 63.6 |
| Alumi | 44 | 3 | 6.8 | 5 | 11.3 | 13 | 29.5 | 23 | 52.4 |

This teble showea tine more then helf of the two groups never made mottoes, emblems, etc. The percentese of those who inaicated thet they use this type of areming aieily was almost three times as great amone the alumni as amons the perents.

Question 13 (Question 9 of the Teachers'
Questionnaire) was:
"Do you eve" do any lettering (plece cerds, fillinc out blanks, etc)?"

The results may be found in Table 13.
Table 13.-TFEQUENCY OF USING DETVERING

| Groups <br> Interviewed | $\begin{aligned} & \text { Tote } \\ & \text { Cese } \end{aligned}$ | Use Lisde of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | De17y |  | Erequently |  | Selom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num } \\ & \text { beer } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { INum } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Fer } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Fer } \\ & \text { Cent } \end{aligned}$ |
| Perents | 122 | 12 | 0.8 | 28 | 23.1 | 36 | 29.4 | 46 | 37.7 |
| AIumn | 45 | 13 | 28.9 | 20 | 44.4 | 9 | 20.0 | 3 | 6.7 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 2 | 7.2 | 15 | 53.5 | 7 | 25.0 | 4 | 14.3 |

A greater percentage of alumni ( 93.3 per cent) then parents ( 62.3 per cent) or teachers ( 85.7 per cent) make some use of lettering. The smaller percentage of use is indicated by the parents. In all the cases the percentage of use is high as compared to the other questions. More alumni checked 'Daily' for the answer to this question than they did for the answer to any other question. In like manner more teachers marked 'Frequently' for the answer to this question then they did for the answer of any other question.

Question 14 was:
"Do you ever make any posters on which lettering is required?"

The parent and alumi answers are presented in Table 14. Table 14.--FREQUENCY OF MAKING POSTERS USING LETIERING

| Groups Interviewed | Total Cases | Use Made of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Dally |  | Frequentiy |  | Seldom |  | Never |  |
|  |  | Num | +Per | Num | Per | Num- | Per | Num |  |
|  |  | ber | Cent | ber | Cent | ber | Cent | ber | Cent |
| Parents | 118 | 3 | 2.5 | 10 | 8.5 | 32 | 27.0 | 73 | 62.0 |
| Alumn | 45 | 2 | 4.4 | 9 | 20.0 | 15 | 33.3 | 19 | 42.3 |

Although this table shows that alumni made posters with lettering more than parents did, in both cases the percentage of those that said they never used it was very high--62.0 per cent for parents and 42.3 per cent for alumni.

Question 15 (Number 6 of the Teachers'
Questionnaire) was:
"Do you ever make any diagrams for the purpose of showing the relation of one object to another or to show the relation between parts?"

The results may be found in Table 15.
Table 15.--FREQUENCY OF MAKING DIAGRAMS FOR THE PURPOSE OF SHOWING THE RELATION OF ONE OBJECT TO ANOTHER

| Groups Interviewed | Total Cases | Use Made of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Dally |  | Frequently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { Ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ner } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | Num- | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ |
| Parents | 122 | 4 | 3.3 | 36 | 39.5 | 40 | 32.8 | 42 | 34.4 |
| Alumn | 44 | 4 | 9.1 | 14 | 31.8 | 14 | 31.8 | 12 | 27.3 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pup11s } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 6 | 21.5 | 6 | 21.5 | 16 | 57.0 |

The number of alumni who answered 'Frequently' and 'Seldom' is the same--14. The number of parents answering 'Frequentiy', 'Seldom', and 'Never' is about the same--36, 40, and 42. Teachers rated the making of diagrams low as shown by the fact that no one answered 'Daily' and 16, or 57 per cent, answered 'Never'. The per cent of alumni who answered 'daily' is about three times as great as the per cent of parents. Question 16 (Number 17 of the Teachers' Questionnaire) was:
"Do you ever read diagrams such as those used to explain the parts of the automobile and the olling and greasing system?"

The answers are found in Table 16.
Table 16.--FREQUENCY OF READING DIAGRAMS

| Groups Interviewed | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequently |  | Seldom |  | Never |  |
|  |  | Num ber | Per Cent | $\begin{array}{\|l\|} \hline \text { Num- } \\ \text { ber } \end{array}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 122 | 17 | 13.5 | 59 | 48.4 | 26 | 21.3 | 20 | 16.8 |
| Alumi | 45 | 10 | 22.2 | 18 | 40.0 | 12 | 26.7 | 5 | 11.1 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 4 | 14.3 | 7 | 25.0 | 11 | 39.2 | 6 | 21.5 |

The number of respondents who indicated thet they had some use for reading diagrams is much greater then the number of those who said they made diagrams. This is evidenced when Tables 15 and 16 are compared. Also in both tables it can be noted that alumni both read and make diagrams more than parents, and thet teachers in both cases make use of them less, as indicated by their 'Never' answers. On the other hend, more teachers did indicate a 'Daily' use in answer to this question than they did for any other question.

Question 17 (Number 7 of the Teachers'
Questionnaire) was:
"Do you ever make any charts or graphs such as organization charts, flow sheets, bar charts, line or curve graphs, pie charts, pictograms, etc.?"

The information secured is presented in Table 17.

Table 17.--FREQUENCY OF MAKING CHARTS OR GRAPHS

| Groups Interviewed | Totel Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Num- } \\ \text { ber } \end{array}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per <br> Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 121 | 4 | 3.2 | 21 | 17.4 | 32 | 26.4 | 64 | 53.0 |
| Alumni | 45 | 5 | 11.1 | 13 | 28.9 | 12 | 26.7 | 15 | 33.3 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils } \\ & \text { Use) } \end{aligned}$ | 28 | 1 | 3.6 | 12 | 42.8 | 9 | 32.2 | 6 | 21.4 |

Although more than half of the parents, 53 per cent, indicated that they never made any charts or graphs, more than two-thirds, 66.7 per cent, of the alumni and about four-fifths, 79.6 per cent, of the teachers did make some use of them. The percentage of parents that answered 'Dally' to this question is about the same as that of the teachers while more than three times as large a percentage of alumni answered 'daily'. The percentage of parents and alumni that answered 'Seldom' is practically the same- -26.4 per cent and 26.7 per cent respectively.

Question 18 (Number 18 of the Teachers' Questionnaire) was:
"Do you ever read charts or graphs such as appear in the newspapers, magazines, and other Iiterature?"

The results may be found in Table 18.

Table 18.-FREQUENCY OF READING CHARTS OR GRAPHS

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | $\left.\begin{array}{\|l\|} \text { Total } \\ \text { Cases } \end{array} \right\rvert\,$ | Use Lade of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Deily |  | Freauently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { per } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Der } \\ & \text { Cent } \\ & \hline \end{aligned}$ |
| Parents | 121 | 14 | 11.6 | 59 | 48.7 | 31 | 25.6 | 17 | 14.1 |
| Alumi | 44 | 6 | 13.6 | 24 | 54.5 | 10 | 22.7 | $\leq$ | 9.2 |
| $\begin{gathered} \text { Teachers } \\ \text { (Puoils' } \\ \text { Use) } \end{gathered}$ | 28 | 2 | 7.2 | 13 | 46.4 | 5 | 17.9 | 8 | 28.5 |

In all three groups the number who enswered 'Frequently' is greater than the number who answered for any other degree of use--about one-half of the total replies for each group. About one-fourth of the parents and alumni read charts and graphs seldom. About trice as many pupils (as stated by teachers) as perents never read cherts ana graphs, and about three times as many pupils as alumi never read them.

Question 19 wes:
"Do you ever make any silhouette drawings?"
The answers are presented in Table 19.

Table 19.--FREQUENCY OF MAKING SILHOUETTE DRAWINGS

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | Total Cases | Use Mace of Draming |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | De.11y |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\left[\begin{array}{l} \text { Per } \\ \text { Cent } \end{array}\right.$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 118 | 1 | 0.9 | 5 | 4.1 | 20 | 17.0 | 92 | 78.0 |
| Alumni | 43 | 0 | 0.0 | 1 | 2.3 | 11 | 25.6 | 31 | 72.1 |

This table shows that very few people ever make silhouette drawings. Dore than 95 per cent indicate only
a 'Seldom' or 'Never' use. Only one person--an artist-denoted a daily use of this kind of drawing.

Question 20 (Number 10 of the Teachers
Questionnaire) was:
"Do you ever make any maps?"
The dete secured may be found in Table 20.
Table 20.--FREQUENCY OF MAKING MAPS

| Groups Interviewed | $\mid \text { Total } \mid$Cases | Use Lade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 119 | 3 | 2.5 | 16 | 13.5 | 39 | 32.7 | 61 | 51.3 |
| Alumi | 44 | 1 | 2.3 | 5 | 11.4 | 16 | 36.3 | 22 | 50.0 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 7 | 25.0 | 9 | 32.2 | 12 | 42.8 |

About one-half of the parents and alumni never
make any maps; while one-third of all groups indicate only a 'Seldom' use. One alumnus and three parents make iaps daily.

Question 21 (Number 19 of the Teachers'
Questionnaire) was:
"Do you ever read any maps?"
The answers may be found in Table 21.
Table 21.--FREQUENCY OF READING MAPS

| Groups Interviewed | Total Cases | Use liade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\left\{\begin{array}{l} \text { Per } \\ \text { Cent } \end{array}\right.$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per <br> Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 120 | 13 | 10.8 | 72 | 60.0 | 27 | 22.5 | 8 | 6.7 |
| Alumni | 45 | 5 | 11.1 | 20 | 44.4 | 17 | 37.8 | 3 | 6.7 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils: } \\ & \text { Use) } \end{aligned}$ | 28 | 1 | 3.6 | 10 | 35.6 | 9 | 32.2 | 8 | 28.6 |

Whereas only four people made maps daily (See
Table 20) nineteen people read them daily. Fewer parents and alumni answered 'Never' to this question than they did to any other question. More parents (72) marked. 'Frequently' in answering this question then they did in answering any other question.

Question 22 (Number 11 of the Teachers:
Questionnaire) was:
"Do you ever make any floor plans for houses or buildings?"

The results may be found in Table 22.
Table 22. - FREQUENCY OF MAKING FLOOR PLANS

| Groups <br> Interviewed | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Da.11y |  | Freauently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 118 | 4 | 3.4 | 27 | 22.9 | 40 | 33.9 | 47 | 39.8 |
| Alumi | 45 | 0 | 0.0 | 8 | 17.8 | 10 | 22.2 | 27 | 60.0 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils! } \\ & \text { Use) } \end{aligned}$ | 28 | 0 | 0.0 | 2 | 7.2 | 9 | 32.2 | 17 | 60.6 |

No alumni or teachers marked a 'Daily' use for making floor plans for houses or building. On the contrary 60 per cent of both groups indicated that they never used this type of drawing. In each degree of use the parents make floor plens more of ten than the elumni or teachers. This indicates that, although the pupil will not have an immediate use for this type of drawing, there is a predictable future use, as shown by the fact that more than 60 per cent of the parents make floor plans.

Question 23 (Number 20 of the Teachers'
Questionnaire) was:
"Do you ever read any floor plans for houses or buildings either in blue print form or as they appear in the magazines?"

The information secured may be found in Teble 23.

Table 23.--FREQUENCY OF READING FLOOR PLANS

| Groups <br> Interviewed | Totel Cases | Use Lade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Freauently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 120 | 13 | 10.8 | 48 | 40.0 | 42 | 35.0 | 17 | 14.2 |
| Alumni | 45 | 1 | 2.2 | 19 | 42.2 | 19 | 42.2 | 6 | 13.4 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils' } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 3 | 10.7 | 12 | 42.8 | 13 | 46.5 |

The table when compared to Table 22 page 47
reveals that more people read floor plans than make them. The percentage of parents and alumni thet read floor plans to some extent is practically the same--85.3 per cent and 86.6 per cent respectively. No teachers indicated that pupils read this type of draving daily. Also only five out of the twenty-eight teachers indicate any use for this type of drawing.

Question 24 (Number 12 of the Teachers'
Questionnaire) was:
"Do you ever make elevations for houses or buildings?"

The answers are presented in Table 24.

Table 24.--FREQUENCY OF MAKING ELEVATIONS

| Groups Interviewed | Total Cases | Use Lade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequently |  | Selom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { Ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent |
| Parents | 118 | 1 | 0.9 | 24 | 20.3 | 18 | 15.3 | 75 | 65.5 |
| Alumni | 45 | 0 | 0.0 | 2 | 4.4 | 8 | 17.8 | 35 | 77.8 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 1 | 3.6 | 4 | 14.3 | 23 | 82.1 |

None of the alumni or teachers (pupil use) and only one parent indicated that they ever made elevations for houses or buildings, while about three-fourths of these grouns revealed that they never made this type of drawing. Parents indicate a greater use to some extent than alumni, and alumni show a greater use than teachers.

Question 25 (Number 21 of the Teachers'
Questionnaire) was:
"Do you ever read elevations for houses or builaings?"

The results follow in Table 25.

Table 25.--FREQUENCY OF READING ELEVATIONS

| Grouns Interviewed | Total <br> Cases | Use Liade of Draving |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Da,17y |  | Frequently |  | Selãom |  | Never |  |
|  |  | Num- | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | Num- | Per | Num- | Per |
| Parents | 120 | 5 | 4.2 | 37 | 30.8 | 31 | 25.8 | 47 | 39.2 |
| Alumni | 45 | 0 | 0.0 | 6 | 13.4 | 21 | 46.6 | 18 | 40.0 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils } \\ & \text { Use) } \end{aligned}$ | 28 | 0 | 0.0 | 2 | 7.2 | 8 | 28.6 | 18 | 64.2 |

Again we find by comparison of this table with Table 24 page 49 that there is a greater use for reading of certain types of drawing than for making them. Whereas in Table 24, page 49133 people seid thet they never made these drawings, in Table 25 only 83 peoole said they never read these dravings. None of the teachers or alumni indicated a 'Daily' use for this reading of elevations of houses or buildings although five perents did so mark. The per cent of teachers who stated that pupils read this type of drawing to some extent is smaller than the per cent of parents or alunni.

Question 26 was:
"Do you ever make any picture sketches or drawings oi a house or builaing?"

Table 26 shows the data secured.

Table 26.--FREQUENCY OF NAKING PICTURE SKETCHES OF HOUSES

| Groups Interviewed | $\left\|\begin{array}{l} \text { Total } \\ \text { Cases } \end{array}\right\|$ | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily Frequently |  |  |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \mathrm{Per} \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \hline \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 119 | 3 | 2.5 | 23 | 19.3 | 50 | 42.0 | 43 | 36.2 |
| Alumi | 45 | 0 | 0.0 | 5 | 11.2 | 20 | 44.4 | 20 | 44.4 |

Almost 60 per cent of the parents end alumni
indicate that they make to some extent dramings or sketches of houses or builaings. None of the alumni and only three of the parents report that they make daily this type of drawing. More parents and alumni indicete a 'Seldom' use than they do a 'rrequent' or 'Dasly' use for this type of drawing.

Question 27 was:
"Do you ever make any picture sketches or drawings of a house or buil¿ing?"

The parents' and alumni replies are presented in Table 27.

Table 27.--FREQUENCY OF MAKING SKETCIES BEFORE FELODELIING ANY PART OF A HONE

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | Total Cases | Use Mide of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Fer } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Fer Cent |
| Parenta | 119 | 1 | 0.8 | 29 | 24.4 | 46 | 38.7 | 43 | 36.1 |
| Alumni | 45 | 0 | 0.0 | 5 | 11.1 | 10 | 22.2. | 30 | 66.7 |

About twice as greet a percentage of perents as alumni revealed that they make shetches or drawings previous to remodelling. Only one parent does this daily.

Question 28 (Number 13 of the Teachers'
Questionnaire) was:
"Do you ever make petterns or cut-outs of objects which are made out of thin meterial - peper, card-board, or sheet metal?"

The results may be found in Table 28.
Table 28.--FREqUENCY OF HAKING PATTERIS OF CUT-OUTS OF OBJECTS

| Groups <br> Interviewea | Totel Ceses | Use Miade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frequently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { Ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | Per Cent |
| Parents | 119 | 3 | 2.5 | 26 | 21.8 | 38 | 32.0 | 52 | 43.7 |
| Alumn | 45 | 1 | 2.3 | 11 | 24.4 | 14 | 31.1 | 19 | 42.2 |
| $\begin{gathered} \text { Teachers } \\ \text { (Pupils' } \\ \text { Use) } \end{gathered}$ | 28 | 0 | 0.0 | 2 | 7.2 | 4 | 14.3 | 22 | 78.5 |

The percentage of parents and alumi who never make developments is practicelly the same, 43.7 per cent and 42.2 per cent, while the percentage of teachers who indicete 'Never' is elmost twice as great--78.5 per cent. The percentage of parents and alumn for each degree of use run almost parallel: 2.5 per cent and 2.3 per cent for 'Daily'; 21.8 per cent and 24.4 per cent for
'Frequently'; and 32.0 per cent and zl.l per cent for 'Seldom'.

Question 29 was:
"Do you ever use patterns, cut-outs, or sheet metal drawings?"

The parents' and alumni answers are presented in Table 29.
Table 29.--FREQUENCY OF USING PATTERNS

| Groups Intervieved | Total Cases | Use Licide of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { Ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Perrents | 118 | 5 | 4.2 | 25 | 21.2 | 45 | 38.2 | 43 | 36.4 |
| Alumnz | 40, | 2 | 4.4 | 12 | 26.7 | 13 | 28.9 | 18 | 40.0 |

The number of parents who never use patterns and those who use them seldom is about the same-- 43 per cent and 45 per cent respectively. The percentage of the parents and alumni who use daily this type of drawing is about the same--4.2 per cent and 4.4 per cent. Also the percentages of these two groups which answered 'Never'
is about the same--36.4 per cent and 40.0 per cent. Question 30 was:
"Dia you ever have occasion to meke or read a patent office drawing? ${ }^{14}$

The information secured may be found in Table 30.
Table 30.--FREQUENCY OF FAKING OR READING A PATENT OFFICE DRAWING

| Groups <br> Interviewed | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Deily |  | Freauently |  | Selcom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{array}{\|l} \hline \text { Num- } \\ \text { ber } \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Perents | 118 | 0 | 0.0 | 13 | 11.0 | 27 | 22.9 | 78 | 66.1 |
| Alumi | 45 | 1 | 2.3 | 7 | 15.6 | 11 | 24.4 | 26 | 57.7 |

The percentages of the parents who enswer to each of the different degrees of use 'Daily', 'Frequently', 'Seldom', and 'Never' is about the same as the percentages of alumni enswering to the seme degree of use. One alumnus indicated that he reaç patent office drawings daily, while no parents answered in this way. A greater per cent of alumni than parents found some use for this type of drawing. Almost one-rourth of both groups indicated that they used this type of drawing seldom.

Question 31 was:
"Heve you ever hed an iaea mhich you consiaered patentable but felt thet you were unable to draw it properly to obtain a patent?"

The results are shown in Teble 31.

Table 31.--FREQUENCY OF NEED TO MAKE A PATENT OSEICE DRAVING

| $\begin{aligned} & \text { Groups } \\ & \text { Interviewed } \end{aligned}$ | Total Cases | Use Liede of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily |  | Freauently |  | Selãom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \text { Per } \\ \text { Cent } \end{array}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{array}{\|l} \text { Num- } \\ \text { ber } \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ |
| Parents | 116 | 1 | 0.9 | 7 | 6.1 | 18 | 15.5 | 90 | 77.5 |
| Alumi | 45 | 0 | 0.0 | 4 | 8.9 | 4 | 8.9 | 37 | 82.2 |

More parents end alumni enswered 'Never' to this
question than they $\mathfrak{a i d}$ to any of the other questions.
No alumni and only one parent indicated that they used this deily.

Question 32 was:
"Do you ever use the scale (an instrument used
for measuring in drewing) for making arawings to different scales?"

The deta are presented in Table 32.
Table 32.--FREQUENCY OF USING A DRAWING SCALE

| Groups Interviewed | Totel Cases | Use Made of Drewing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | De.11y |  | Frecuently |  | Selcom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Per } \\ \text { Cent } \\ \hline \end{array}$ | $\begin{aligned} & \text { Num } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cer: } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 119 | 18 | 15.1 | 24 | 20.2 | 33 | 27.7 | 44 | 37.0 |
| Alumni | 45 | 6 | 13.4 | 14 | 31.1 | 11 | 24.4 | 14 | 31.1 |

About two-thirás of both parents and alumni reported thet they used the drawing scale to some extent. Alnost the same percentage of parents and alumni indicated that they use the scale deily.

Question 33 (Number 14 of the Teachers'
Questionnaire) was:
"Do you ever use the T-square or triangles in ruling lines for making office forms, borders,

The results may be found in Table 33.
Table 33.--FREQUENCY OF USE OF THE T-SQUAFE AND TRIANGLES

| Groups Intervierred | Total Cases | Use Made of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Daily Freauentiy |  |  |  | Seldom |  | Never |  |
|  |  | Number | $\begin{array}{\|c\|} \hline \text { Per } \\ \text { Cent } \end{array}$ | Number | Per Cent | Number | Per Cent | Num- | Per Cent |
| Parents | 121 | 12 | 9.9 | 31 | 25.6 | 35 | 27.3 | 45 | 37.2 |
| Alumni | 45 | 7 | 15.5 | 18 | 40.0 | 6 | 13.4 | 14 | 31.1 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils } \\ & \text { Use) } \end{aligned}$ | 28 | 1 | 3.6 | 2 | 7.2 | 7 | 25.0 | 18 | 64.2 |

Although e.bout two-thirds of the parents and elumni indicate that they use the T-square and triangles to some degree, only about one-third of the pupils have a use for it as indicated by the teachers. A grester percentage of alumni than parents or teachers reported a deily use of T-square and triangles.

Question 34 (Number 15 of the Teachers' Questionnaire) was:
"Do you ever use the ruling or inking pen for making ink lines?"

The dete. secureà may be founc in Teble 34.
Table 34.--FREQUENCY OF USING THE FULING PEN

| $\begin{gathered} \text { Groups } \\ \text { Interviewed } \end{gathered}$ | $\begin{aligned} & \text { Total } \\ & \text { Cases } \end{aligned}$ | Use Nade of Drawing |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Deily |  | Frecuently |  | Seldom |  | Never |  |
|  |  | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \text { Per } \\ & \text { Cent } \end{aligned}$ | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | Per Cent | $\begin{aligned} & \text { Num- } \\ & \text { ber } \end{aligned}$ | $\begin{aligned} & \hline \text { Per } \\ & \text { Cent } \end{aligned}$ |
| Parents | 119 | 7 | 5.9 | 22 | 18.5 | 40 | 33.6 | 50 | 42.0 |
| Alumni | 45 | 6 | 13.3 | 15 | 35.3 | 12 | 26.7 | 12 | 26.7 |
| $\begin{aligned} & \text { Teachers } \\ & \text { (Pupils: } \\ & \text { Use) } \end{aligned}$ | 28 | 1 | 3.6 | 2 | 7.2 | 2 | 7.2 | 23 | 82.0 |

A grecter percentege of alumni then parents use the ruling pen to some extent, while the percentage of the parents that use it is about four times as great a.s the percentage of pupils, according to the teachers' replies, that use it.

In addition to the 34 questions asked perents and alumni, the teachers were asked question 8 of Teachers' Questionnaire whether pupils ever made notebook covers in which lines or designs are drewn. Of the 28 teechers, one answered 'Daily', l2, 'Frequently', seven 'Seldom', and eight 'Never'. The percentage of teachers' answers was 3.6 per cent, 42.8 per cent, 25.0 per cent, and 28.6 per cent respectively.

The final question in the Teachers'

Questionnaire asked: "Do you find (fewer), (About the seme), (more) diagrems, cherts, graphs, and line drewings in the text-books used today than in those used five or ten years ago?" (See Appendix) results revealed that 25 teachers ste.ted that in text-books with which they were familiar more diagrams, cherts, graphs, and line graphs are found today; troo teachers stated the number was about the same; and one stated there were fewer.

In reply to the supplementary question: "Have you studied drawing?" 58 parents indicated that they had and 59 indicated that they had not. Teble 35 page 59 shows a comparison of their enswers to the 34 questions. Since the number of parents in both groups is not the same, for purposes of comparison only percentages were: given. In every question the per cent of perents tho answered 'Daily' was greater for those who had indicated that they had studied drawing then for those who had not. In questions 16 and 21 the per cent of parents who answered 'Frequently' was greater for those who had not studied drawing then for those who had. In all other questions marked 'Frequently' the opposite is true. Among those parents who had not studied drawing there was a greater per cent who answered the questions 'Never' then there was among those perents who had stuaied drawing. The foregoing anelysis of this table reveals that those people who hed studied drawing make use of it

|  |  <br>  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |
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|  | 的以 <br>  |  |  |  |  |  |  |  |  |  |
|  |  <br>  <br>  |  |  |  |  |  |  |  |  |  |

in their daily activities much more than do those who have not stuảied drawing.

Since questionnaires were sent only to alumni who had studied drawing their answers ell fell into one group.

The various occupations in which the perents and alumni were engaged, as revealed by their answers in the space given for that purpose at the end of the duestionnaire, have been listed in Chapter III, pages 18 and 19.

An analysis and interpretation of the foregoing findings will be presented in the following chapter.

## Chapter V <br> ANALYSIS OF DATA

The first step in the anclysis of the cieta presented in the previous chapter is to see how meny types of draving, as revealed by the questions, were used daily or frequently by 25 per cent or more of the parents, alumni, and pupils (teachers' enswers). Table 36 on the following page gives in a condensed and combinea form the percentages of each of the three groups which indicate a deily and frequent use for the drewings referrea to by the 34 questions. This table reveals thet ten out of the 34 questions were enswered by 'Daily' or 'Frequently' by less then 25 per cent oi the perents. It further shows that the same number of questions out of the whole list vas marked 'Deily' and 'Frequently' by less then 25 per cent of the alumni. Although there were ten cuestions in each group which ranked low in use only seven of these ranked low in both groups. This table further shows thet the replies to 11 out of the 20 teachers' questions-which correspond to the perent-alumni questionnaire-inaficated e daily or frequent use by less then 25 per cent of the pupils.

The first step of the analysis is completed by applying the first criterion as set up in Chepter III,

Table 36.--PERCENTAGE OF PARENTS, ALUNAI, AND TEACHERS WHO USE DRAWING DAIIY AND FREQUENTLY

| Question Number | Percentages |  |  |
| :---: | :---: | :---: | :---: |
|  | Parents | Alumni | Teachers |
| 1. | 39.7 | 47.7 | 39.2 |
| 2. | 52.5 | 53.3 | 50.0 |
| 3. | 48.8 | 35.6 |  |
| 4. | 55.0 | 52.3 |  |
| 5. | 38.3 | 46.4 | 10.7 |
| 6. | 44.1 | 53.3 | 25.0 |
| 7. | 43.8 | 42.2 | 7.2 |
| 8. | 58.2 | 68.2 |  |
| 9. | 65.9 | 60.0 |  |
| 10. | 35.3 | 42.2 | 7.2 |
| 11. | 50.0 | 46.7 |  |
| 12. | 10.1 | 18.1 |  |
| 13. | 32.9 | 73.3 | 60.7 |
| 14. | 11.0 | 24.4 |  |
| 15. | 32.8 | 40.9 | 21.5 |
| 16. | 61.9 | 62.2 | 39.3 |
| 17. | 20.6 | 40.0 | 46.4 |
| 18. | 60.3 | 68.1 | 53.6 |
| 19. | 5.0 | 2.3 |  |
| 20. | 16.0 | 13.7 | 25.0 |
| 21. | 70.8 | 55.5 | 39.2 |
| 22. | 26.3 | 17.8 | 7.2 |
| 23. | 50.8 | 44.2 | 10.7 |
| 24. | 21.2 | 4.4 | 3.6 |
| 25. | 35.0 | 13.4 | 7.2 |
| 26. | 21.8 | 11.2 |  |
| 27. | 25.2 | 11.1 |  |
| 28. | 24.3 | 26.7 | 7.2 |
| 29. | 25.4 | 31.1 |  |
| 30. | 11.0 | 17.9 |  |
| 31. | 7.0 | 8.9 |  |
| 32. | 35.3 | 44.5 |  |
| 33. | 35.5 | 55.5 | 10.8 |
| 34. | 24.4 | 46.6 | 10.8 |

page 25. Table 37 page 64 shows which questions were answered by 'Daily' or 'Frequently' by 25 per cent or more of each or the three groups--parents, Elumni, anci teachers. This reveals thet all but 13 types or areming-indicated by questions--are used by 25 per cent or nore of eech of two out of the three groups. The 11 types of craving which should be excluded from the course on this basis are:

1. Naking mottoes or emblems
2. liaking posters vith lettering
3. Naking silhouette ärevings
4. Liaking maps
5. Making floor plens for houses
6. Naking elevations for houses
7. Reading elevetions for houses
8. Neking picture sketches of houses
9. Making picture sketches for remodelling houses
10. Liking developments
11. Reading patent office drewings
12. Making petent office dravings
13. Using the ruling pen

It further reveals thet seven types of draving-making mechanical picture arawings, making free-hand picture sketches, reading free-hend orthographic sketches, doing lettering, reacing diagrans, reading cherts end graphs, and reading maps--are used daily or frequently by 25 per cent of the people in all three sroups, while 14 types are used deily or frequently by 25 per cent or more of two out of the three groups.

The second step of the enalysis was to rank the types of drawing, about which the questions induire, on $\varepsilon$. besis which combines $2 I l$ three degrees of use for the purpose of aiscovering which ones renk in the upper

Table 37.--QUESTIONS ANSNERED 'DAIIY' AND 'FREQUENTLY' BY 25 PER CENT OR NORE OF THE PARENTS, ALUMNI, AND TEAGHERS

| Question | Used Daily or Frequently |
| :--- | :--- |
| Number | By 25 Per Cent or More |

two-thirds of the groups.
The values assigned the verious degrees of use were three for Daily, two for Frecuently, and one for Seldom. Upon this basis the replies of the parents are ranked in Table 38, page 67. The question dealine with map reading ranked the highest with a velue of 210 , while the question about making silhouette arewings ranked lest with a value of 30.

The replies of the elumni were ranked by the seme method as wes used in ranking the perents. Table 39, page 67, shows how they rank in total value. The question Which asked the use for doing lettering rankea highest With e total value of 88 , while a value of 12 placed the questions on meking elevations for houses enc the need for maling patent office drawings at the bottom of the IIst.

The teachers' replies to the 21 questions which they answered are renked in Teble 40, page 68. Both the number of the original teachers' question and the corresponding number of the parent-alumni cuestionnaire are presented, the letter in parenthesis. This letter number will be the one referred to in future analysis for the sake of clearness. The question dealing with doing lettering ranked highest with a velue of 43 , while the question dealing with making elevetions ranked lowest with a value of six.

A comparison of the ranking of the questions

Table 38.--PARENTS' REPLIES RANKED ACCORDING TO VALUES OF ONE FOR SELDOM; TWO FOR FREQUENTLY; AND THREE FOR DAILY

| Rank | Question | Value | Rank | Question | Value |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| 1. | 21 | 210 | 18. | 15 | 124 |
| 2. | 16 | 195 | 19. | 10 | 121 |
| 3. | 18 | 191 | 20. | 25 | 120 |
| 4. | 8 | 187 | 21. | 29 | 110 |
| 5. | 9 | 183 | 22. | 27 | 107 |
| 6. | 11 | 180 | 23. | 22 | 106 |
| 7. | 23 | 177 | 24. | 26 | 105 |
| 8. | 4 | 174 | 25. | 34 | 105 |
| 9. | 2 | 157 | 26. | 28 | 99 |
| 10. | 6 | 148 | 27. | 17 | 86 |
| 11. | 7 | 146 | 28. | 20 | 80 |
| 12. | 3 | 145 | 29. | 24 | 69 |
| 13. | 5 | 139 | 30. | 14 | 61 |
| 14. | 1 | 136 | 31. | 12 | 58 |
| 15. | 32 | 135 | 32. | 30 | 53 |
| 16. | 33 | 131 | 33. | 31 | 35 |
| 17. | 13 | 128 | 34. | 19 | 33 |

Table 39.--ALUNNI REPLIES RANKED ACCORDING TO VALUES OF ONE FOR SELDOM; TWO IOR FREQUENTLY; AND THREE FOR DAILY

| Rank | Question | Value | Rank | Question | Value |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| 1. | 13 | 88 | 18. | 32 | 57 |
| 2. | 16 | 78 | 19. | 10 | 55 |
| 3. | 18 | 76 | 20. | 15 | 54 |
| 4. | 8 | 74 | 21. | 17 | 53 |
| 5. | 9 | 74 | 22. | 29 | 43 |
| 6. | 21 | 72 | 23. | 14 | 39 |
| 7. | 2 | 68 | 24. | 28 | 39 |
| 8. | 1 | 67 | 25. | 25 | 33 |
| 9. | 4 | 64 | 26. | 12 | 32 |
| 10. | 6 | 64 | 27. | 26 | 30 |
| 11. | 33 | 63 | 28. | 20 | 29 |
| 12. | 11 | 62 | 29. | 30 | 28 |
| 13. | 7 | 61 | 30. | 22 | 26 |
| 14. | 3 | 60 | 31. | 27 | 20 |
| 15. | 23 | 60 | 32. | 19 | 13 |
| 16. | 34 | 60 | 33. | 24 | 12 |
| 17. | 5 | 59 | 34. | 31 | 12 |
|  |  |  |  |  |  |

Table 40. --TEACHERS' REPLIES RANKED ACCORDING TO VAIUES OF ONE FOR SEIDDM, TWO FOR FREQUENTIY, AND THREE FOR DAIIY

| Rank | Question | Value |
| :---: | :---: | :---: |
| 1. | 9 (13) | 43 |
| 2. | 1 (2) | 39 |
| 3. | 2 ( 1 ) | 38 |
| 4. | 17 (16) | 37 |
| 5. | 18 18) | 37 |
| 6. | 7 (17) | 36 |
| 7. | 8 | 34 |
| 8. | 19 (21) | 32 |
| 9. | 10 (20) | 23 |
| 10. | 16 ( 6 | 21 |
| 11. | 20 (23) | 18 |
| 12. | 6 (15) | 18 |
| 13. | 14 (33) | 18 |
| 14. | 3 (5) | 14 |
| 15. | 11 (22) | 13 |
| 16. | 21 (25) | 12 |
| 17. | $\left.4{ }^{4}\right\}$ | 11 |
| 18. | 5 510) | 11 |
| 19. | 15 34 3 | 9 |
| 20. | 13 (28) | 8 |
| 21. | 12 (24) | 6 |

Number in Parenthesis Is the Corresponding Number
of the Parent-Alumni Questionnaire
by the three groups (See Tables 38, 39, 40, pages 67 and 68 reveals thet in each arrangement the value assiened the question ranking first is seven times as great as the value assigned the question or questions renizing lest-210 to 33 for parents, 88 to 12 Por $\varepsilon l u m n i$, end 43 to 6 for teachers. The number velues in the three groups do not correspond because each group was maje up of $\varepsilon$ aifferent number of individuals--123 perents, 45 elumni, and 28 teachers. In both the alumni and teacher groups the same type of drawing, lettering, ranked highest and the same type, drawing elevations, ranked lowest.

The final analysis in the second step was to apply the second criterion, as given in Chapter III, page 25. This states thet a type of drawing must renk in the upper two-thirad in two out of the three groups before it should be included in the proposed course of study. Table 41, page 70, reveals which types of drawing rank in the upper two-thirds of each of the three groups of parents, alumni, and teachers. This table is besed on the data presented in Tables 38,39 , enā 40 , pages 67, and 68, and it shows thet ll types of arawing rank in the upper two-thiras in all three groups, while 10 types renk in the upper two-thirds in two out of the three groups. It further shows that the following 13 types of drewing feil to rank in the upper two-thirds in two out of the three groups:

Table 41.--REPLIES OF QUESTIONS WHICH RANKED IN THE UPFER TWO-THIRDS AFTER VAIUES WERE ASSIGNED

| Question <br> Number | Ranked in Upper Two-Thirds |
| :---: | :---: |
|  | Parents Alumni Teachers |


$X=$ Meets Requirement
$-=$ Lacks Requirement
$0=$ No Corresponding Number

1. Leking mottoes or emblems
2. Laking posters with lettering
3. Makine silhouette arawings
4. Wakine meps
5. Wakine floor plens for houses
6. Kaking elevations for houses
7. Reading elevations for houses
8. Haking picture sketches of houses
9. Liking picture sketches for remodelling houses
10. Vaking developments
11. Reading petent office dravings
12. Nekine petent office aravings
13. Using the ruling pen

A thira major step in the analysis of the data
revealed Iron the replies to the 34 questions, combines the results found by separate application of the two criteris to discover which types of drawing meet both of these and thereby should be included in the course of study. Such an analysis reveals thet the seme 13 types of draming which failed to meet the first criterion also failed to meet the seconc criterion. Therefore, these types or drawins, as listed on page 65 and page 71 of this chepter, should not be included in the course.

A reference to the fincings, as presented in Chapter IV, shows that each of the types of dravings which hes been discarded is used very little by any of the three groups from whom the data were secured. Table 12, page 39, shows that more than one helf of the people who answered never made mottoes or emblems. The percentage of people who said that they never meke posters with lettering is very high as shown by Table 14, page 40. Teble 19, page 45, reveals thet very fev: people ever make silhouette drawings. The replies to Question

20, showm in Table 20, page 45, revealea thet about onehalf of the parents and alumni never make maps. Floor plans for houses were made by 60 per cent of the perents but only by 40 per cent of the alumi end pupils, as revealed by the data in Table 22, page 47. Table 24, page 49 , shows that ebout three-fourths of the people in each group never meke elevations of houses. Although more people read elevetions then make them, the percentage of those who read them frequently or daily is very low, as revealed by Table 25, page 50. References to Tables 26, 27, 28, 30, 31, and 34, pages 51, 52, 54, 55, 57 show that meking sketches of houses, making sketches for the purpose of remodeling, making developments, patterns, reading patent office drawings, making patent office arawings, anc using the ruling pen has no place in the daily life of many of the people from whom the information was secured.

An anelysis of the 34 questions on the basis of the kind of use (read or make) revealed thet 12 questions involved a reading use, while 21 involved a making use, and one involved both. All but one, 91.6 per cent, of the twelve questions involving reading were ranked high enough to justify their inclusion in a course, while only $13,61.7$ per cent, out of 21 of the questions involving a making use ranked high enough to be included. This indicates that there is a greater use for reading drawing then there is for making it.

On the basis of use made by parents, elumin, ana pupils the following should be included in the proposed course:

1. Laking mechanical picture drawings
2. Liaking free-hand picture sketches
3. Liaking free-hand picture drawings in which dimensions are included
4. Reading free-hand picture sketches in which dimensions are included
5. Waking free-hend orthocrephic siretches
6. Feading free-hand orthographic sketches
7. Haking mechanical orthographic sketches
8. Reading mechenicel orthogrephic sketches
9. Using drawing for the purpose of assembling
10. Liaking sectional views
11. Feading sectional viers
12. Doing lettering
13. Naking diagrems
14. Reading iiagrems
15. Lieking charts and graphs
16. Reading cherts and graphs
17. Reading maps
18. Reading floor plans for houses or builcings
19. Using patterns or sheet metal draviness
20. Using the scale
21. Using the T-square and triengles

In organizing these various activities into a
course of stuay in sraphic representation some of them mey be combined end some mey be used as a means in teaching others. Althoumh there is no scientific basis for this order these activities vill be presented as learning units in the order in which the writer intends to use them:

1. To do good lettering
2. To make and reed Iree-hand picture sketches
3. To make and read orthorrephic sketches
4. To use the T-soucre anō trianciles in ruling lines--layine out a cirawing sheet
5. To use the dreming scele
6. To make and read orthographic drewings meae vith drewing instruments
7. To make and read dravings containing sectional views
8. To use a drewing for the purpose of assembling an article or machine
9. To make mechanical pictorial drewings
10. To make and read charts and graphs
11. To make anc read diegrans
12. To read sheet metel cirawings
13. To read meps
14. To read floor plens of houses end builaines

If the learning units here can be presented in
less time then is prescribed by the school authorities for the course, additionel units may be selected from those which ranked highest of those which were excluded. (See Tables 38, 39, and 40, pages 67, and 68.) If, on the other hand, there are too many learnins units to be covered in the time allotted those which ranked lowest (See Tables $38,39,40$, pages 67, end 68) in the above list should be dropped from the course.

In using these learning units it seems advisable to precede each unit with a prognostic test to discover how well the pupil cen elready do the type of things called for. For instance, a boy may be able to read maps well enough so thet no further school training in map reading is justiriable.

After this course has been used for several years a definite time allowance can better be assicned to each unit. This can be based on the average time required by the pupils in the particulen school for e period of years.

This thesis study has not been attempted to discover or set up any teachins methods whereby eech of these units can be taught. Althourh this stuay revealed
how frequently the averese citizen had occasion to use the verious types of grephic representetion it dic not show to whet aegree each of these is used. For instance, free-hand picture sisetches are made frequently by more than 40 per cent of the parents, alumni, enc pupils (See Table 2, page 29), yet there is no evidence of what kind of picture sketches these people made.

In order for this study to be of the greatest
value it should be followed by studies to determine: how nuch time shoula be used in presenting each unit, what are the best methocis of teeching eech of these units, end to Whet degree of complexity or cifficulty each tyoe of drawing is used by the average citizen.

Chapter VI

## SUMARY OF FINDINGS

An analysis of previous studies revealed a wide variety of possible uses for graphic representation.

This study showed thet parents who had not studied drawing use it less in their everyday life then those who had studied it.

A greater use was manifested for reading certain types of drawing than for making them.

The 21 types of drewing used daily or frequently by 25 per cent or more of two out of the three groups, parents, alumni, and teachers, and the types which rank in the upper two-thirds in two out of the three groups-when ranked on the basis of values of three for 'Daily' two for 'Frequently', and one for 'Seldom'-- were identical.

When the values mentioned above were assigned to the replies the use for certain types of drawing wes found to be about seven tines as great as the use for other types.

A course of study in grephic representation designed to meet the needs of the average citizen should include the following teaching units:

1. To do good lettering
2. To make and read free-hand picture sketches
3. To make and read orthographic slsetches
4. To use the $T$-square ana triangles in ruling lines-- laying out a draming sheet
5. To use the drawing scele
6. To make and read orthographic arawings made with drawing instruments
7. To make and read drawings containing sectional views
8. To use a drawing for the puroose of assembling an article or machine
9. To make mechanical pictorial drawings
10. To make and read diagrams
11. To make and read cherts and graphs
12. To read sheet metal drawings
13. To read maps
14. To read floor plans of houses and buildings

The need for several additional studies grew out
of this study.

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A F F E X D X
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LETTER SEN WITH QUESMOMNAIRE TO EAニM.TS
Downers Grove High School Downers Grove, Illinois

To the Parents of Students of D. G. H. S.
In order that we may improve our course in mechenicel drawing by offering as units of instruction those phases of drawing which the average citizen has $e$ need for, I would appreciate your cooperation in answering the following questions which are for the purpose of discovering the various uses we have for crewing.

Below is a list of different types of graphic representations which appear in current literature. Will you kināly check in the proper space the extent to which you make use of any of these either in your daily Fork, hobby, or as e. matter of getting general infornation.

If you think of other ways you have used mechanical drawing, will you please add then on the beck of one of these sheets.

Thank you for your courtesy and trouble,
Very truly yours,


Instructor in Drawing

LETTER SENT WITH QUESMONNAIRE TO EAETMS
Downers Grove Mich School Downers Grove, Illinois

To the Parents of Students of D. G. H. S.
In order that we may improve our course in mechenicel drevinc by offering as units of instruction those phases of drawing which the average citizen has e. need for, I would appreciate your co-operetion in answering the following questions which are for the purpose of discovering the various uses we have for crewing.

Below is a list of different types of graphic representations which appear in current literature. Will you finally check in the proper space the extent to which you make use of any of these either in your daily Fork, hobby, or as E. matter of getting general infornation.

If you think of other ways you have used mechanical drewing, will you please add then on the beck of one of these sheets.

Thank you for your courtesy and trouble,
Very truly yours,

Instructor in Drawing

## LETTER SENE WITH QUESTIONNAIRE TO ALUMS <br> Downers Grove High School Downers Grove, Illinois

To the Alumni of D. G. H. S.
In order to include in our drawing course those phases of the work which will be of most service to the student after he graduates, I am marring a survey to ascertain to what extent the different phases of crewing are used.

Inasmuch as you have taken a course in drawing in the Downers Grove High School we feel that you are qualified to give information which will help us improve our work.
Your answers to the following questions will
be aporecieted.

$$
\begin{aligned}
& \text { very truly yours, } \\
& \text { 2r.R. Cleveland }
\end{aligned}
$$

Instructor in Drawing

## LETTER SENT WITH QUESMIONAIRE TO ALUNI

Downers Grove Hioh School Dormers Grove, Iilino1s

To the Alumi of $D . G . H . S$.
In order to include in our arawing course those phases of the work which will be of most service to the student efter he graduates, I am mairing a survey to ascertain to what extent the difierent pheses of areming Ere used.

Inasmuch as you have taken a course in drawing in the Downers Grove High School we feel thet you are qualified to give information which will help us improve our mork.
Your answers to the following questions will be aporecieted.

Very truly yours,


Instructor in Drewing

## NOTE INCLUDED WITH QUESTIONNAIRES TO BE GIVEN OUT EY TEACHERS

Dear 1
These envelopes contein questionnaires which I an sending to the parents of students, picked at rendom from the student body.

Will you please pass them out, ask the students to heve them filled out by Nonada, if possible, and returned to you. You may then place them in my box. I am sorry thet these heve come $\varepsilon t$ such $\varepsilon$ busy time, and I greatly appreciate any cooperetion you mey sive me in helping to get them out and returned.

## QUESTIONS

In answering these ouestions mill you kinaly indicate the cegree of use you make of the different types of drewing by encircling the letter which best cescribes your use:
(D) - deily; (F) - frequently; (S) - seldom; (N) - never.
I. Do you ever meke picture dravings in which you use a straight edge or other arewing instruments? (A picture drawing shows the object as it appeers to the eye, similar to a photograph). D. S. S. N.
2. Do you ever make a free-hand picture shetch? D. F. S. N.
3. Do you ever mexe a free-hend picture sketch in which you incluãe dimensions? D. F. S. N.
4. Do you ever read free-hend picture sketches which include dimensions? D. F.S. N.
5. Do you ever make a free-hand multi-viev or orthographic sketch of objects? In this type of drewing the front, top end side viers of the object are drewn seperately, as instead of as one view $\longrightarrow$

D. F.S.N.
6. Do you ever read free-hand multi-viev or orthographic sketches? D. F. S. N.
7. Do you ever make multi-view or orthogrephic drevings by using a straight eage or other dreving instruments? Such drawings might include thines which you intend to meke or have soneone make for you. D. F. S. N.
8. Do you ever read multi-viev: dravings which have been made with instruments? Liny such arewings which occur in megezines show how to meke. pieces of furniture, cabinets, and verious appliances. D. F. S. M.
9. Do you ever use $a$ drawing for the puroose of assembling an article or machine? D. F. S.N.
10. Do you ever make drawings in which there are sectionel vievs (portions cut aray to enable one to see the interior construction or to eid with assembling)? D. F. S. N.
11. Do you ever read drewings containine sectionsl vievrs? D. F.S.N.
12. Do you ever make any mottoes or emblems such as are used in advertising, trede-merks, cesigns, stemps, medals, insignie, enc. the like? D. F. S. N.
13. Do you ever do any lettering (place caras, filling out blanke, etc.) D. E. S.N.
14. Do you ever make any posters on which lettering is requirea? D. F. S.N.
15. Do you ever make any diagrams for the puroose of showine the relation or one object to another or to show the reletion between perts? D. F. S. N.
16. Do you ever read diagrams such as those used to explain the perts of the automobile and the oiling or greasing systems. Also diazrems with verious electricel appliences such as radio, weshing mechines, etc? D.F.S.N.
17. Do you ever make any cherts or graphs such as organization chert, ilow sheet, bair cherts, line and curve graphs, pie cherte, pictograms, etc.)? D.F.S.N.
18. Do you ever read cherts or graphs such es appear in the newspapers, magazines, and other literature? D. F.S.N.
19. Do you ever make any silhouette draminss? D. F. S. N.
20. Do you ever make any meps? D. F. S. N.
21. Do you ever reed any maps? D.F.S.N.
22. Do you ever make any floor plans for houses or buildings? D. E. S. N.
23.- Do you ever read any floor plens for houses or buildings, either in blue print fom or as they appear in the magezines D. F. S. E.
24. Do you ever meke elevetions ior houses or buildings? D. F. S. N.
25. Do you ever reed elevetions for houses or builcings? D. F. S. I.
26. Do you ever make any picture sketches or drawings of $\varepsilon$ house or building? D. F. S. i.
27. Do you ever meke sketches or arewinçs previous to remodelling eny part of your home? D. ت. S. N.
28. Do you ever meke patterns or cut-outs of objects which are made out of thin meterial - paper, cercboera, on sheet metal? A arrewing of this kind gives the unfolded view of an object. D. F. S.N.
29. Do you ever use pettemns, cut-outs, or sheet metsl drewings? D. E.S.N.
30. Dia you ever heve occesion to meke or read a. patent oifice araming? D. E. S. N.
31. Have you ever hed an iaee you consicered petentable but felt thet you vere unable to àrew it properly to obtein e patent. D. F. S.N.
32. Do you ever use the scele (an instrument used for meesurine in dreving) for marinc arewincs to different sceles? D. F. S. N.
35. Do you ever use the $T$-square or triengles in ruling lines for makins office iorms, borajers, etc. D.E.S.N.
34. Do you ever use the ruling or inkinc pen for making ink lines? D. F. S. N.

Have you stuaied areving?

Occupetion

April 10, 1938
To the Teachers of D.G.F.S
In order that the work offered in Lechanicel Drawing may be of the greatest possible value to the student both in school and after he leaves school, I would appreciate your cooperation in answering the following questions. From your answers I hope to get information whereby our wort in Drawing may be reorganized in such a may as to bring about a greater correlation between it and the other school subjects.

Thank you for your cooperation.
W. R. Cleveland

Do your students have occasion in preparation or presentation of their work to make any of the following types of graphic representations? Indicate the degree of use by underlining the letter (D) - daily; (F) frequently; (S) - seldom; (N) - never.

1. Freehand picture sketches D. E. S. N.
2. Picture drawings in which a straight edge or other instruments ere used D. F. S. N.
3. Freehand multi-view sketches. In this type of drawing the front, top, end side views of an object are drawn separately as - instead of as one view $\qquad$ (picture sketch) D. Э. S. N.
4. Lulti-vier ararings by using a straicht eãe or other drawing instruments D. F. S. N.
5. Drawings in which there are sectional views (portions cut amay to enable one to see the interior construction) D. F. S. N.
6. Diagrems for the puxpose of showine the reletion of one object to another or to show the reletion between perts D. F.S.N.
7. Cherts or graphs D. F. S. N.
8. Noteboois covers in which lines or designs are dram D. F. S. N.
9. Lettering D. F. S. N.
10. Laps D. F. S. N.
11. Floor plens D. F. S. N.
12. House or builaing elevations D. F. S. N.
13. Fa.tterns of objects which when folded up make the object D. F. S. N.
14. Rule up forms D. F.S. N.
15. Inked lines with muline pen or compass D. E. S.N.

Do your students have occasion in preperstion or presentation of their work to read any of the following types of graphic representations?
16. Free-hand mulitiview sketches or aremincs D. F. S. N.
17. Diagrams D. F.S.N.
18. Charts or graphs D. F.S.N.
19. Laps D. ․ S. N.
20. Floor plans D. E. S. N.
21. House or builainc plens D.F.S. N.

Dc you find (fewer) (about the same) (more) aiacrems, charts, grephs, and line arewings in the text-booss used today then in those lised five or ten yeers eso?

Table 42.--NUMBER CF TINES PUFILS LIST USES OF DRAWING IN OTHER CIASSES
Type of
Drawing
Number of
Times Listed
Notebook covers ..... 22
Lettering ..... 21
Geometrical figures ..... 12
Drawing lines ..... 8
Making charts and graphs ..... 8
Making sketches ..... 8
Making diagrams ..... 7
Using a compass ..... 6
Map work ..... 4
Reading drawings in textbooks ..... 3
Space work ..... 3
Sectional view of house ..... 2
Plans for stage-setting ..... 2
Using triangles ..... 2
Drawing illustrations ..... 1
Perspective drawing ..... 1
Furniture drawing ..... 1

| Ques- <br> tion <br> Num- | Individual Quesiionneires |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1 | 2 | $\overline{3}$ | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 |
| 1. | S | N | S | 5 | E | $\Sigma$ | E | S | S | S | $F$ | S | E | D |
| 2. | N | F | $F$ | F | F | $F$ | D | $F$ | F | S | $F$ | 15 | $E$ |  |
| 3. | S | F | $F$ | Fr | $F$ | F | D | F | $\Xi$ | S | $F$ | N |  |  |
| 4. | D | $F$ | T | I | $F$ | ? | $\bar{\square}$ | $\overline{\mathrm{F}}$ | $F$ | F | F | F | F |  |
| 5. | S | $F$ | $\Sigma$ | S | S | $F$ | F | $\vec{F}$ | $F$ | S | $F$ | S |  |  |
| 6. | D | D | E | I | 1 | $\bar{F}$ | 3 | $F$ | $F$ | F | $\bar{\square}$ | S | S |  |
| 7. | N | S | $\bar{F}$ | S | N | $F$ | 3 | S | F | $F$ | $F$ | $F$ |  |  |
| 8. | $F$ | D | D | $F$ | S | F | $\vec{F}$ | D | D | F | D | D | S |  |
| 9. | D | F | S | S | 2 | $F$ | . | D | D | F | F | D | S | D |
| $\begin{aligned} & \pm 0 \\ & 34 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Fioure I.--Semple of Liaster Sheet Used in Recoraing the Answers Received from Parents, Alunni, and Tecchers

QUESTIONS USED IN THE STUDY ITADE BY TA. F. M. TALSE. Check the word which describes how much you heve used the followins:

1. Have you read a house or builaine plen? D. छ. S. N.
2. Hiave you made a sketch, plen, or arewing of a house
3. Or building? D. . S. N.
4. Have you reea the plens of a hendy kitcinen in $\equiv$ paper or magazine? D. E. S. N.
5. \#Did you ever make a tentetive sketch or drawing previous to remodelling a room or part of a building? D. F.S.N.
6. Have you ever made a sketch or plan of a gerden or lawn with e view to making it more beauti iul? D. F. S. N.
7. Did you ever lay out anc̄ letter a sign of any kina? D. ت. S. N.
8. Did you ever lay out and cut a stencil? D. E. S. X.
9. Have you ever helpeci your wife lay out a ciress pattern? D. F. S.N.
10. Have you ever enlerced, copiec or reduced en embroidery design? D. F. S. N.
11. Have you ever built a piece of iumiture from a draving? D. F.S.N.
12. Have you ever sketched or dram an interesting piece of furniture you intended to make or have made? D. ‥ S. N.
13. Have you ever read an automobile or machine oiling chert? D. F. S. N.
14. Have you made a sketch of a broken piece of equip-
ment to sena ewey for needed repair? D. F. S. N.
15. Have you ever read e greph or chert in a magezine, peper, or lecture māé for the purpose of meking comparisons, etc.? D. F.S. N.
16. Have you ever made a chart like the above? D. F.
S. N.

Have you read a map? D. F. S. N.
17. Have you made a map? D. F. S. N.
18. Heve you had a patentable iciea but felt thet you were uneble to properly drew it to obtein a petent? D. E.S. N.
19. *Dia you ever make $\approx$ petent office cirawing? D. F.S.N.
20. HHave you evez Essembled an Erticle or machine from a drawing? D. F.S.N.
21. Heve you read two cirawings of a device which were made for the purpose of showing superiority of one over the other? D. F. S. N.
22. Have you taken neasurements thet required great Eccuracy? D. F. S. H.
23. Have you built a redio set from a drewing?
24. Did you ever lay out a penel for the parts of $E$ redio set? D. F. S.N.
*Questions used by the writer in this study.

# THESIS ABSTRACT <br> NON-VOCATIONAL COURSE CONTENT IN <br> GRAPHIC REPPESENTATIONS 

Submitted by
William R. Cleveland

August 1938

ABSMRACT
Modern trends in education and the demends of every-ãay life make it imperative that all courses included in a high school progrem be under constant revision. Ve cannot assume that a course once valuable will always be valuable. Non-vocational courses should be recognized as such and their content so orgenized.

Thus, the problem of this thesis is: A study of the uses made of different kinds of graphic representetion by the citizens of $\varepsilon$ residential suburb of a lerge comnercial and incustrial city, using es e. type, Downers Grove, Illinois, a suburio of Chicago, Illinois, for the purpose of establishing a non-vocational course in the high school deeling with grephic representetions.

The term "graphic representetion" has been selected rether than the term "drewing" because of the narrow meaning often given to the letter. Drewing is usually thought of as pertaining to mechanical draming or artistic arawing or both, but it is not thought of as including cherts, grephs, diagrems, maps and sletches.

The basis upon which the proposed non-vocational course will be established is the uses revealed from the stuay.

The aim of the course is: to give the pupil treining in reading and making the different kinas of graphic representations which the averege citizen uses toãy.

Several studies have been made which were basea on
parents use of drawing in home life; pupil use in home Iife, drawings read in magazines and newspapers ano space given in newspapers, magazines, mailed advertisements, and school library books. However, none of these include all three groups which are surveyed in this study, nor are all elements of the problem so definitely related to one community and its needs. Attention is also celled to the fact that six years of great inductrial growth has elapsed since the last of these studies was made. During this time the need for a course, such as proposed, has become more evic̄ent.

To secure the dete needed for solving the problem unaertaken three groups of people vere called upon. These three groups were parents of the pupils, alumni who had studied drawing some time during the years 1930-1938, and teachers of the Downers Grove High School. The parents and alumi were questioned to determine their use for graphic representations while the teachers were interviewed to discover the use which pupils had for it in their school subjects and hobby clubs.

The data were gathered from the parents and alumni by the use of a questionnaire; the same questionnaire vas used for both groups. The dats were obtsined from the
teachers by means of personal interviews.
The content of the questionnaire ves developed from the finaings of a stuay maae by Kr. William P. HEle In which he reviewed 102 newspepers, 60 megazines, 126 mailed edvertisements, end 158 school library books to discover how frequently drewings occurred in them; from questions used by Lir. Frank W. Walsh in his study of 1828 to determine the uses of mechenicel drewing in every-dey home life; and from other questions açied by the writer. The body of the questionnaire consisted of 34 questions some of which inquired whether a person read certain types of drewing and others whether he made them. A few questions asked whether he made use of certein common drawing room tools. The person answering the questionnaire was asked to indicate the extent to which he used the drawings by checking the letters D. (daily), F. (frequently), $S$ (seldom), and N. (never). Two supplementary questions were edaed; the first or vinich was to determine if the respondents had studied drewing and the second was regeraing their occupetions or meens of livelihood.

The interview questionnaire to be used with teachers was developed from a list made by the drewing pupils of the various mays in which they used mechanicel. arewing in their other school subjects.

In determining to which parents to send questionnaires a random selection was made from the nemes of
parents of all pupils in the high school. A totel of 864 names were available after duplicete names were eliminated. These were placed on cards and these cards were shufiled. They were then deelt out by placing the first three cards on one pile and the fourth card on a second pile. This dealing was continued until all the cards were divided into two piles. The pile with every Iourth card conteined the names of 216 parents. Twenty parents out of this group were interviewed for the purpose of testing whether the questionnaire was within the comprehension of the average citizen. As a result of these interviews the questions were revisea and put in their final form. These questionnaires were sent home by the chilaren of those parents who had been selected; out of 196 sent out by this method 103 were returned. These with the 20 interviews made $e$ total of 123 perent returns.

Questionnaires were sent by mail to ell graduates who could be loceted who hed been enrolled in a course in mechanical drawing in the hieh school during the lest eight years. Out of 163 questionnaires sent out 45 were returned.

As the questionnaires were returned the replies were recorded on master sheets in such $a$ way that the identity of the replies of each questionnaire was not lost. From these master sheets comperisons were made between the replies of those who haj studied drewing and those who had not, and it was found thet in every cese those who had stuaied drawing mede much greeter use of it then those who
had not.
The deta on the master sheets vere further analyzed and the following criteria were aviled to them to determine which types of drawing should be inoluded in a proposed course of study: that if 25 per cent or more of each of two out of the three groups replied thet they used deily or frequently a certein type of drawing ana thet if in two groups of the three that same type of drawing renked in the upper two-thirds of the answers after they had been arrenged eccording to velues then thet type should be included. The velves assigned eech degree of use were three for 'āally', two for 'frequently', and one for 'seldom'.

This analysis revealed that 21 types of drewing should be included in the proposed course. It so happened thet the tyoes of drawing which setisfied the requirements of the first criterion were the same types which satisfied the requirements of the secona criterion. The 21 types of drewing which were selected on the basis of use made of it by perents, alumni, anc pupils vere:

1. Haking mechanical picture drawings
2. Making free-hand picture sketches
3. Niaking free-hand picture drewings in which dimensions are included
4. Reading free-hand picture sketches in which dimensions sre included
5. Laking free-hand orthogrephic sketches
6. Reading free-hand orthographic sketches
7. Making mechanical orthographic sketches
8. Reading mechanical orthographic sketches
9. Using drawing for the purpose of assembling
10. Making sectional views
11. Reading sectional views
12. Doing lettering
13. Making diagrams
14. Reading diagrams
15. Eeking charts and graphs
16. Reading cherts end graphs
17. Reading maps
18. Reading floor plens for houses or buildings
19. Using patterns or sheetmetel arawings
20. Using the scale
21. Using the $T$-square and triangles

The 34 questions were analyzed on the kina of use (read or make) and the analysis revealed that ll out of 12 questions involving a reading use were among those selected for the proposed course, and 13 out of the 21 questions involving a making use ranked high enough to be included in the course.

In organizing the 21 types of drawing into a course of study in graphic representation some of them may be combined and some may be used as a means in teaching others. The one aim of the course is: to give the pupil training in reading and making the different kinas of graphic representation which the average citizen uses today. The writer is aware of the fact that there are other objectives for the ususl mechanical drawing course, and, no doubt, some of these other objectives cen be fulfilled in this proposed course of study. Although there is no scientific basis for this order these types are presented as learning units in the order in which the writer intends to use them:

1. To do good lettering
2. To make and read free-hand picture sketches
3. To make and read orthographic sketches
4. To use the $T$-square and triangles in ruling lines--laying out a drawing sheet
5. To use the drawing scale
6. To make and read orthographic drawings made with drawing instruments
7. To make and rea $\mathfrak{a}$ dravings containing sectional views
8. To use a $\overline{\text { E rawing for the purpose of essembling }}$ an article or machine
9. To make mechanical pictorial àramings
10. To make and read diagrams
11. To make and reać charts anç grephs
12. To read maps
13. To read sheet met 1 d drewings
14. To read fioor plans of houses anc buildings The proposed course of study is presented in outline form. No attempt is made to set up methoas by which the verious units should be teught. Neither are any exercises or plates proposed, nor does the element of time fequired to present each unit enter into consideretion. The need for several additional studies grew out of this study. Such studies should be made to determine: hor much time should be used in presenting each unit, what are the best methoas of teaching each of these units, and to what degree of complexity or difficulty each type of draming is used by the average citizen.
