ANALYSIS OF INDUSTRIAL DRAWING BOOKS PUBLISHED SINCE 1940

By

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CHAPTER I

THE PURPOSE AND TECHNIQUES

There have been many books published in the post war years pertaining to the field of drawing. Many of these books have been written by well known authors, men who are considered leaders in the educational field. Others have been published that were written by men who are less well known in the field of education.

There are several reasons for the increased number of drawing books published in the last decade. The enrollment has increased in all of the schools from the primary grades through college. Technical schools have increased their enrollment and many new schools have been established. Free books to veterans have created a greater demand for textbooks with some classes having two instead of one. Perhaps the greatest single factor is changes made by industry in the methods of production. These changes made some of the material found in the older books obsolete, therefore it was necessary to write new books giving the latest information relative to industry. These are some of the reasons for the increased number of drawing books appearing on the market.

Purpose of This Study. The purpose of this study is to find as many books as possible written on some phase of drawing, and make an analysis of the books found. The objective of the analysis is primarily to determine their value as a textbook, however their use as reference material is also considered.

Methods of Analysis. In making the analysis of the material in the books a score card is used to record a value for various points considered in each book. An explanatory sheet is also used to explain the points to be considered and how to arrive at a given value for each point considered.

A page analysis is made of the ten books rated the highest. This analysis is made on the basis of twenty five topics which are found in most drawing books. This information will be explained in detail in a later chapter.

Limitations of Study. There are no limitations to this study so far as material is concerned. It may be assumed that most of the books with which this study is concerned may be found in the library. There are only two factors limiting this study. They are time and the inability of a single person to analyse any textbook accurately.

Definition of Terms. Below is a list of educational terms and their definitions which are used frequently in this report. The purpose of the definitions is to give the reader a clear concept of the special terms. They are as follows:

> Education is the development of general intelligence by a system of study and discipline or by experience of life. Education includes not only systematic schooling and formal methods of acquiring knowledge, but also that enlightenment and understanding which is gained through experiences. (7A, page 26)

> Elementary Education. The period of formal education beginning in childhood, usually at the age of 5 to 7 years, and ending approximately with adolescence, at the beginning of secondary education; variously defined as including grades 1 to 8, and sometimes nursery school and kindergarten, or as ending with grade 6, as in places in which the six-three-three plan are in common use. (6A, page 149)

> Mechanical Drawing. It depicts objects of three dimensions on the surface of a sheet of paper having but two dimensions. By means of lines, drawn by the aid of mechanical

drawing instruments, various views of an object are represented, full size or to scale. (8A, page 1)

Graphic Art. All forms of representation by means of lines, strokes, drawings, paintings, and, sometimes, modeling. (6A, page 30)

Review of Previous Studies. A study of similar reports has been helpful in preparing this report. A survey of previous reports indicates that there have been analysis of various books in connection with reports and theses. The writer could not find any report which made an analysis of all books pertaining to a given subject and published in a given time. However, two reports have been reviewed which analysed drawing books.

The Shirk Study. A report was written by Howard Jesse Shirk in 1946. The title of the report is, "An Analysis of High School Industrial Drawing Textbooks and a Listing of Manufacturers' Catalogs and Teaching Aids Usable in Industrial Drafting Courses." In this report, Shirk selected a total of thirty nine books related to the field of industrial drawing, to be analysed. In evaluating these thirty nine books Shirk used the criteria for selection of a text as given by Randolph Hoelscher, in his book, "The Teaching of Mechanical Drawing." By using this criteria, a final selection of eleven books was made and these books were used in making a page analysis. The purpose of the page analysis was to determine how many pages each author devoted to a particular subject. A table was prepared showing a comparison of the various authors. (2 D)

The McGlamery Study. Kenneth W. McGlamery completed his report in 1947. The title of the report was, "Industrial Drawing as an Indispensable in The Industrial Arts Program." In this report McGlamery evaluated three books which were recommended by the committee on the selection of

industrial drawing textbooks for state adoption. The purpose of the analysis was to show comparative values of the three books in twenty different characteristics. The results as shown by the report indicated that all three books rated very closely.

Plan for Presenting the Material in This Report. The history of drawing is developed in chapter two, beginning with the early history of the line and continuing with the progress and development of drawing until its current position in the American schools. Chapter three discusses the early movements and philosophies leading to the present industrial arts program in the American school system. In chapter four will be found a discussion of some of the criteria for analysing textbooks to be used in industrial arts subjects. Also a table showing the rating of each book that was analysed. (1 D)

In preparing this report the library technique was used extensively.

CHAPTER II

THE HISTORICAL DEVELOPMENT OF DRAWING

The introduction of mechanical drawing as a separate subject in the public schools of America was opposed by both the public and school officials. It was felt by the school officials that the place for mechanical drawing was in the technical and engineering schools for the more advanced students. They failed to realize that knowledge gained from a course in mechanical drawing would be beneficial to the student regardless of what occupation he might choose to follow.

The first to introduce drawing were the larger shcool systems located in the industrial centers. When it was found that these schools were successful the leaders in the field of education began to realize that all students, both boys and girls, could benefit from a course in drawing. Since that time drawing has made rapid progress and is taught in most of the high schools in America.

PART A

EARLY HISTORY OF DRAWING

The line which is the basis of all drawing has been used by man throughout the ages to express himself. The line in its elementary form has a history which dates back to the beginning of time, and was used as a means of communication long before any form of writing had been invented. ". . . and one must not forget that there is in line a universal language, which

can be understood by people of every race, by the ignorant as well as the cultured, and which convinces by an illusion of the fullest realism." (3 A, page 8)

Ancient History of Drawing. The history of drawing has been traced back to more than fifty thousand years ago by archaeologists. The manner in which drawing was done is believed to be about the same in all of the countries during the Madgalenian era. That is, the line sketches were made by using a piece of burnt wood or sharpened flint. However, the symbols used in ancient Greece were different from those used in Spain. Several writers have tried to answer the question, "Why did the cave dwellers draw?" (3 A, page 15) The conclusion most acceptable is, "A natural impulse, which every human being possesses in childhood but which is often lost in the competition of other interests or destroyed by dull teaching." (3 A, page 15) However, the magic of the line was used to relieve the monotony of the walls of the cave. Some of the early cave dwellers even went so far as to add color to their drawings, thus adding still more beauty to their decorating ingenuity. Most of the drawings, which were discovered in the caves, were of animals such as the horse, goat, bison and oxen. Nearly all of these drawings were of life size and according to artists have been classified as being of remarkable artistic quality.

In passing from the ancient history of drawing to the more modern aspects we cannot overlook the fifteenth century, which is often referred to as, "A Century of Glory." (3 A, page 42) "Today, illuminated addresses, scrolls of honour, fine book production, and similar decorative work are still indebted to the splendid sense of design which was developed by monastic artists of the middle ages; but much of the loving labour by which books

were then produced was soon to be made unnecessary." (3 A, page 41) The fifteenth century artist produced a range and quality of art which has become an inspiration to artists of later ages.

PART B

A HISTORY OF THE DEVELOPMENT OF DRAWING IN AMERICA

In order to understand the problems confronting the development of drawing in America, it is necessary to review the development of drawing in Europe during the seventeenth and eighteenth centuries.

The introduction of mechanical drawing was not until after the Renaissance period. Since there were only a very few machines in use and these were of a simple design, there had not been a need for mechanical drawing. What few machines were in use were usually designed and built by one person. If more than a written description was found necessary the tradesmen would add a pictorial drawing to give the needed information.

The industrial revolution and the use of steam as a source of power were the two greatest factors leading to the development of mechanical drawing. Since the production of machines was becoming more complex, the old method of a written description and a simple pictorial view led to confusion as well as waste and increased costs. Therefore, it was necessary to develop a method of drawing which could be used to give more of the details which were so vital to good production and quality machines.

In the years prior to 1865 France was leading the world in the field of engineering education and the development of instruction in technical drawing. Technical drawing had reached a high standard in the trade and industrial schools, as to subject matter and method of instruction. The following is an outline of instruction which was used in the technical

drawing schools:

1. Early emphasis on geometrical drawing, followed by,
2. Projection drawing leading up to dimensioned sketches at the same time giving special attention to training the memory for form and developing the constructive imagination.
3. Drawing to scale.
4. Machine drawing taught through the making of sections and details from assembly drawings and assembly drawings from detail drawings.
5. Designing parts of machines, applying knowledge of strength of materials.
6. Visiting factories to make dimensioned sketches of machines from which finished drawings were to be made. (1 A, page 284)

These same methods of instruction were to be used later in the schools of America.

History of Drawing in the Nineteenth Century. The first public schools of America to introduce drawing as a part of the curriculum was the public schools of Boston. In 1821 William Bently Fowle, a member of the Boston School Committee volunteered to take charge of a school when the master became ill. Fowle remained in the school, making teaching his life work. He was very successful and made many changes in the school, one being the teaching of drawing as an integral part of the school work. (1 A, page 416)

Fowle obtained a copy of a drawing book by Louis Benjamin Francoeur which was published in France. After translating it into the English language Fowle published the book under the title, "The Eye and Hand."

In 1882 there was a drawing book published, which was considered remarkable by a group who examined the book. The book was written by John Rubens Smith, who was a teacher in a drawing academy in New York. The title of this book was, "The Juvenile Drawing Book." (1 A, page 407) Smith's book was written and designed to give a liberal education to boys

and girls in drawing, shading, and coloring. The method of instruction contained in the book was based upon copying which was an almost universally accepted method of instruction. Smith did not advocate doing away with copying but he did advocate making copying more intelligent. In his book there were twenty four plates each one a successive step to the previous one. Plate number one included the drawing of circles, ovals and arcs very freely. These were followed with vertical lines and lines which were commonly used as angles of intersection. More emphasis was placed on the proper method of holding the pencil and free movement. These plates progressed through geometric figures, foliage and the trunks of trees. When the students began plate eighteen they were taught ways of combining all of the elements learned into pictures. Opposite each one of these plates was a full page of carefully worded directions for the students to follow. The following is a paragraph from the introduction to Smith's book:

> On inspecting this book, you will no doubt feel some disappointment at not finding pretty little landscapes and gaudy flowers, as has hitherto been the fashion: but have patience; copy what is here set down, which may be considered as the alphabet of the art, and you will soon be gratified with as many pleasing objects as you may wish, besides being enabled hereby to execute them with more ease and satisfaction than by any other method you can hope to accomplish. (1 A, page 409)

After reading this introductory paragraph one can understand what Smith meant when he proposed to make copying more intelligent.

Although Boston was the first public school system to teach drawing it was not too far ahead of public schools in other large cities in America. In fact, it passed up the opportunity to remain in the lead when it failed to appoint a special drawing teacher and make drawing a separate part of the school organization.

Throughout the history of the American schools, changes in the curri-

culum have always been made to meet the demands made by the public which the schools are serving. The very nature of the population in southern Ohio was the reason for Cincinnati public schools becoming the leader in the field of drawing for public schools. For the most part the population was made up of Germans who were highly skilled craftsmen. These craftsmen recognized the need for drawing as a definite part of the public school instruction. Also a report was made to the Ohio legislature in 1838 by Calvin Stowe, on the schools of Europe, in this report Stowe gave some prominence to drawing. Therefore, Cincinnati was destined to become the leader in developing drawing as a separate part of the curriculum.

The first regularly appointed teacher of drawing in the Cincinnati schools was J. W. Bowers in 1846. Bowers taught lines and perspective drawing as well as the drawing of maps. In 1847 a drawing department was established with W. B. Shattuck as the teacher in charge and in the same year elements of drawing was included in the course of study for grades three to six inclusive. In the seventh grade, linear drawing was taught and perspective in the eighth grade. Shades and shadows was taught in the ninth grade. By 1851 the children of the primary grades were given slates and pencils and encouraged to draw from copies. Drawing had progressed until in the year 1863 the course of instruction for the upper grades were as follows:

> Grade E.---They shall be taught to draw vertical and horizontal lines; the square, the rectangle, and figures composed of squares and rectangles. A few examples are to be given, and then the pupils are to be encouraged to build up designs of their own, as they would with blocks.
>
> Grade D.---They shall be taught to draw oblique lines, and figures composed of squares, parallelograms, triangles, etc., the pupils being encouraged to originate designs. They should also now begin to draw objects in outline.

> Grade C.---They shall be taught to draw cubes, rectangular solids, curved lines and objects, first in outline and then shaded.
>
> Grade B.---They shall be taught to draw ten different simple mechanical implements, the leaves of ten different kinds of forest trees, and the outlines of ten different maps.
>
> Grade A.---They shall be taught to draw ten different articles of household furniture, or mechanical implements; ten maps with parallels and meridians; a ground plan of their schoolroom, showing the location of the various articles it contains; and ten miscellaneous objects, selected by the teacher. (1A, page 436)

The above grades are the same as the fourth, fifth, sixth, seventh, and eighth grades in the present system of schools.

Drawing books published by Bartholomew were adopted by the public schools of Cincinnati in the year 1865. The following year two special teachers were employed to teach drawing and students who were leaving the school found employment solely on the ground of their ability to draw. It was incidents like this which caused the superintendent to make a report on the progress of the drawing department, of which he was very much pleased.

The superintendent made his report in 1867, and the following year 1868, drawing was made a required subject of instruction in all of the schools. The same year a supervisor, Arthur Forbriger was employed. Under the direction of Mr. Forbriger the department was reorganized. The plan of giving instruction under the direction of Mr. Forbriger is given in the following paragraph which is taken from the superintendent's report of 1869:

> The drawing teachers give lessons in the A, B and C grades of the district schools. The three lower grades are taught by the regular teachers, who are themselves taught by Mr. Forbriger--the schools of each grade, in accordance with a resolution of the Board, being dismissed once a month, on Friday afternoon, at recess, to permit the teachers to gather at some convenient school house for the purpose of receiving such instruction. In

> these meetings the work of the schools for the month, in the respective grades, is laid out and explained. The teachers, with due attention to these lessons, and a proper determination to meet the requirements of the Board, will find no great difficulty in transferring to their pupils the instruction they have themselves received at these meetings and the ease and efficiency with which they can do so will constantly grow with practice. (1 A, page 437)

From the above report one can easily see the difficulties with which the early teachers of drawing were faced.

The supervisor devoted two days a week which was almost one half of his time to teaching and the remainder to supervision. However, under the direction of Mr. Forbriger the drawing department advanced very rapidly and the need for new textbooks became apparent, particularly for the elementary grades. A series of drawing books were written by Robert Demcker who was teaching German in the Cincinnati schools. These books were published under the title, "Course of Systematic and Progressive Drawing," and introduced into the public school system. The method of instruction contained in the series was drill exercises. This series of books did not meet with the approval of Mr. Forbriger and he later prepared a series of drawing pads which were used in the schools under his supervision for many years. Each exercise could be torn off when completed and placed in an envelope where it would be kept clean.

Ohio led the nation in making drawing an integral part of the public school instruction with the possible exception of Massachusetts. However, Ohio was the first to provide a special teacher and a paid supervisor of drawing.

PART C

RECENT HISTORY OF MECHANICAL DRAWING

By the end of the nineteenth century mechanical drawing was assuming its place on the curricula of the public schools. It had been introduced in a large per cent of the schools before the establishment of manual training. However, drawing was slower to gain the support of the public in general and the leaders in education failed to recognize its importance. Nevertheless drawing did have the support of industry which needed technically trained men.

The Development of Drawing in the United States From 1870 to 1935. During the ten year period from 1874 to 1884, only three of the ten schools teaching manual training were offering some form of drawing. In other words only thirty per cent of the schools teaching manual training were teaching drawing. At this time only a small per cent of the schools were offering manual training. The next ten year period shown a percentage gain both in drawing and manual training. The period from 1884 to 1894 according to reports made by Stombaugh show that 84.7 per cent of the schools offering manual training were teaching freehand drawing. While 88.9 per cent were teaching mechanical drawing. The schools teaching manual training for the same ten year period showed a gain of 720 per cent over the previous ten year period. From these figures one can easily see that manual training was making greater gains in the public schools than drawing. (12 A, page 70)

Another interesting report which was made of fifty-two cities offering manual training courses, shows the relationship of the progress of manual training over that made by drawing. The report, which was based

on records of the fifty-two cities for the school year 1893 to 1894, showed that fifty-two per cent of the cities had introduced drawing previous to the introduction of manual training. Only 3.8 per cent had introduced manual training during the one year previous to the introduction of drawing courses. The other 44.2 per cent of the cities reported the introduction of drawing and manual training at the same time. The report also showed that for the schools introducing drawing first, drawing had been included in the course of study from one to twenty-two years. This gives drawing a median of eight and one-half years before the introduction of manual training. (12 A, page 72)

The following statements, which were made by five men at a meeting of the School Crafts Club of New York, will serve to illustrate the general opinions of educators at the beginning of the twentieth century. These remarks were made to Mr. Flint who was chairman of the meeting in 1903 and are as follows:

> Mr. Harold Brown questioned the wisdom of spending so much time in the careful inking of mechanical drawings. He thought the introduction of some problems in design in correlation with the mechanical work would be better than a cut-and-dried course in the latter.
>
> Mr. Stimpson recognized the value of inking in drawings as counteracting the tendency to careless and slovenly habits. It is good for a boy to make a finished piece of work.
>
> Mr. A. H. Chamberlain held that, while a knowledge of projection was necessary, there was a danger in carrying mechanical drawing too far. In many English schools where great emphasis was placed upon this work the artistic spirit was lacking. Too much of it may kill out the appreciation of art. The notion that the special ability gained in mechanical drawing--as, for instance, accuracy--may be carried over into other lines of work is open to question.
>
> Mr. Tilders defended mechanical drawing. The work is not given to make pupils architects or draftsmen, but to develop their faculties. The accuracy gained here must be

> helpful in other lines, and it is a kind of training which is not to be had in any other line of work.
>
> Referring to the value of mechanical drawing, Dr. Haney pointed out four phases of the subject, each having a distinct educational value. First, projection; this he considered good training, developing the power of clear thinking. Second, planning, which aids the appreciation of relations of magnitude. Third, constructive design, training the perception of proportion and symmetry. Fourth, the mechanics of the work. Some of this is very desirable as training in skill, but after muscular co-ordination has been attained all further work in the same lines become useless. (3 C, page 243)

From the above statements, one would reach the conclusion that as late as 1903 leaders could not agree on the objectives of drawing in the public schools.

In 1920 a committee of teachers in Cincinnati made a survey of sixty three of the larger cities in America. The purpose of this survey was to determine to what extent textbooks were used in mechanical drawing classes. According to the report made by the committee of teachers, fifty per cent of the schools used some kind of a textbook. Thirty nine per cent did not use a book of any kind. The remaining eleven per cent used miscellaneous material in their classes.

In the same survey it was found that mechanical drawing was an elective in seventy per cent of the schools for boys, while only forty per cent of the schools made the course elective for girls. Thirty per cent of the schools made their drawing classes available for both boys and girls. (1 C, page 122)

This survey shows some progress by mechanical drawing over previous surveys and reports which have been made by various organizations. The first classes were open only to boys and as late as 1920 only a small per cent of the schools were allowing mixed classes.

By 1927 drawing had become a part of the industrial arts program and was recognized as such among the leaders. At the A. V. A. Convention in December of 1927 a committee was appointed to make additional studies about the problems facing industrial arts. The problems had been discussed by the members at the convention, and it was felt that more information and study was needed. Some of the leading educators in the field of industrial arts were members of the committee. They were William T. Bawden, William E. Roberts, Clyde A. Bowman, Emanuel E. Ericson, Charles F. Bauder, Robert W. Selvidge, and Maris M. Proffitt. This group, after making a further study of the problems confronting industrial arts, prepared a list of objectives, which are still used to some extent today. (1 B, page 19)

The use of textbooks as teaching aids in the drawing classes has made rapid gains. Today few classes are taught without the use of one or more texts.

CHAPTER III

DRAWING IN THE AMERICAN SCHOOLS

The philosophy of leaders in education have been responsible, in one way or another, for present and future trends in education. The present schools of America are the results of the philosophy of early leaders in the field of education. In order to have a better understanding of the place of drawing in the industrial arts program in the present schools of America, it will be necessary to review the lives of some of the early educators. For it is from their ideas that drawing was made a part of the industrial arts program.

PART A

EARLY EDUCATIONAL LEADERS AND THEIR PHILOSOPHIES

Some of these early leaders in education were Rousseau, Basedow, and Pestalozzi. It was these men who were the first to advocate the use of natural instincts and natural tendencies as a means of educating the child.

Rousseau, who was born in 1712 and died in 1778, was a French philosopher and writer. In 1762, Rousseau published a book entitled Emile. Emile is an imaginary child to whom he proposes to give a model education in an ideal society. In Emile Rousseau expresses the idea that the education of a child comes from the experiences of the child rather than from ideas. Rousseau would first direct the child to the grandeur of nature,

to stimulate the child's curiosity. Then he would ask the child questions which were suitable to his capacities. However, he would not provide the answers to the questions but let the child provide his own answers. By doing this, he contends that he is teaching the child how to reason.

Rousseau could see the value of being able to do more than one thing. He stressed the importance of learning occupations in agriculture and other trades requiring the use of the hands. In his opinion, it was the duty of the rich as well as the poor to learn a trade. By learning a trade the child would have a tool, with which to make a living, if other ambitions were to fail. This idea is expressed in the following quotation.

> A trade for my son! My son a working man! What are you thinking of, sir? Madam, my thoughts are wiser than yours; you want to make him fit for nothing but a lord, a marquis, or a prince; and some day he may be less than nothing. I want to give him a rank which he cannot lose, a rank which will always do him honour; I want to raise him to the status of a man, and, what ever you may say, he will have fewer equals in that rank than in your own. (11 A, page 159)

It was the philosophy of Rousseau which helped to prepare the foundation for the industrial arts program found in the modern schools of today, when he made the following statement about education. "The great secret of education is to use exercises of mind and body as relaxation one to the other." (11 A, page 165) This same idea is provided for in the objectives of industrial arts programs of the modern schools.

Another great philosopher, who was influenced by the writings of Rosseau and who has influenced the present schools of America, was Basedow. Johann Basedow was born in 1723 and died in 1790, a German student of theology and professor of philosophy. Basedow directed his interest and abilities toward a program for the elementary school. In 1774, a book was published entitled, Elementarwerk, in this book Basedow combined ideas from

the work of three great men, Comenius, Bacon, and Rousseau. The book contained many illustrations for children of the elementary school.

In the same year, with the aid of Prince Leopold, Basedow established a school at Dessear. The interesting thing about the school is that a regular part of the school course included turning, planing and carpentry. This was the first time that handicraft training had been taught in schools. It was this school established by Basedow and others which were similar, that had a profound influence on the education of the children in northern Europe. (4 A, page 35)

Pestalozzi, a Swiss, who was born in 1746 and died in 1826, was also influenced by the writings of Rousseau. Pestalozzi spent most of his life putting into practice ideas expressed by Rousseau in Emile. These schools were for the destitute children and many of these were closed after a short period of time, because of the lack of administrative ability of Pestalozzi.

Probably the first industrial school for poor children was established by Pestalozzi, at Neuhoff, in 1775. The students received some elementary schooling while working part time at some occupation such as farming or some type of domestic work. The following is a list of the principles which guided Pestalozzi in his work:

1. The condition of the poor should be improved.
2. This improvement must come through education.
3. Education must be conducted according to nature-work through things, to ideas. Sense perception was therefore important in learning.
4. Education must prepare for life. Pupils should therefore be given definite occupational training.
5. All children, both rich and poor, should receive this kind of education. (4 A, page 36)

Even though the ideas of Pestalozzi were derived from the influence of Rousseau, Pestalozzi has often been referred to as the "father of industrial education." The reason for this is the fact that Pestalozzi put ideas into practical use.

Development of Education in America in the Eighteenth Century. Before the Revolutionary War the relationship between America and the old world was very good. This relationship had a great influence on the progress of education in the United States. There were some differences between the Colonies as to the method of schooling their children. For instance, in the New England section of the Colonies there was an early tax supported system of common schools. The church groups dominated the schooling of the central Colonies, while in the south the English system was used. This system provided tutors or private schools for those who could afford it. There were pauper schools for the less fortunate class of people.

Industrial arts, as it is known today, was not a part of the instruction of any of these schools regardless of the system used, but it was soon to become a part of the instruction. There were existing schools in Europe that had been teaching handicraft with a fair degree of success. Also the philosophy of the early leaders in Europe had a strong influence on the early leaders of education in America. The first schools in America to teach subjects such as woodworking, drawing and etc. were not the elementary schools, which had been the case in Europe, but the secondary schools or schools of higher learning.

There were two early movements which had a lasting influence and aided the progress of industrial arts. They were the Manual Labor Academy of Pennsylvania located at Germantown, Pennsylvania, and the Oneida Institute

of Science and Industry, located near Utica, New York.

The objectives of these two schools were not to develop skills and knowledge that would be useful for employment, but to provide the students with physical exercise that would be healthful. Also, one of the objectives was to help pay the expenses of the student. This made it possible for many students to go to school who would not have gone otherwise.

There was another movement that was to have great influence on the American schools. This movement was known as the Mechanic Institute Movement. The origin of this type of institution was in a society of artisans in Glasgow, Scotland, in 1823. One of the first societies to be organized in America was the General Society of Mechanics and Tradesmen, of the city of New York, in 1785. There were other organizations later in the larger cities such as Boston, Cincinnati, Rochester, and Philadelphia. These schools offered instruction in evening classes in academic subjects as well as laboratory work and drafting. In some of these schools, shopwork was being offered. By 1870, the Mechanic Institute Movement had made much progress in America.

The two men who did more to further the progress of industrial arts, in the early American schools, were Calvin M. Woodward and I. D. Runkle.

Dr. Woodward was a professor of mathematics at the Washington University. He first began his teaching of woodwork when he discovered a lack of ability and knowledge of tools among his students. In order that the students might have a better visualization of objects which were being taught in mathematics, he required them to construct the objects out of wood. He found that very few of the students were able to construct the required objects. Woodward then asked the carpenter to give these students instruction in elementary woodwork. At this time, Woodward saw the value of the

orderly arrangement of tool instruction as was evidenced by the Russian system.

In every shop there hung:

1. A board upon which were samples of the regular course of study pursued in that shop;

2. A board to which was fastened one of the regular bench sets of tools, the name of each tool being on the board in large letters;

3. Rules for the internal order of the shop, made by the manager of the shop and approved by the pedagogical conference;

4. A list of the benches, vises, furniture, machines, etc., constituting the equipment of the shop; and

5. The daily program of work. (2 A, page 19)

The Russian system provided for progress from the simple experiences to the more complex experiences.

In 1880, after seeing the value of shop instruction as related to other subjects, Woodward opened the first "manual" training school in America. This school was in connection with the Washington University.

> The course of instruction, the making of which was a most important factor in the success of the school and, in fact, constituted the distinctive feature of this new type of secondary school, consisted of five fundamental lines of study carried on simultaneously: 1. Mathematics, 2. Science, 3. Language, 4. Drawing, and 5. Shopwork. (2 A, page 353

The course of instruction was designed to cover a period of three years. Three of the courses being intellectual and two courses, drawing and shopwork, being both intellectual and manual.

Runkle, who was president of Massachusetts Institution of Technology, observed that students with some shop experience found employment quicker than those who did not have these experiences. It was this observation which caused him to provide shopwork as part of the training for engineering students.

Woodward and Runkle could see the possibilities of shopwork instruction in the high schools. One of the phrases Woodward used while making speeches was, "put the whole boy to school." The following is a statement he used in explaining the general education philosophy which he advocated for the work in the shop.

> An exercise, whether with tools or with books, is valuable only in proportion to the demand it makes upon the mind for intelligent, thoughtful work. In the school shop the stage of mechanical habit is never reached: the only habit is that of thinking. (4 A, page 65)

Woodward opened his private Manual Training School on September 6, 1880. Within the next decade there were thirty eight public high schools which introduced shopwork organized in about the same manner as that of Woodward's. By 1900, there were one hundred and sixty nine manual training schools. By 1909, more than half of the cities reported the teaching of manual training in their schools.

From the philosophy of Woodward and Runkle resulted the manual training movement in the schools of America. This movement began to spread to the high schools in 1880 and continued until the early part of the nineteenth century. Since then, the manual training movement has been dominated by the term industrial arts and the objectives have been broadened.

PART B

INDUSTRIAL ARTS IN THE TWENTIETH CENTURY

Manual training was not sufficient in its objectives to last very long in the twentieth century schools. Many changes were being made, machines were replacing the hands in production. In the early day when almost everything needed by the family was made at home the children had

a chance to learn various trades, but with the turn of the century this was becoming more and more impossible. People were becoming specialized in one particular field, depending more upon the production of others for their necessities. This made it impossible for the child to get any instruction at home. Therefore, the curricula of the schools had to change if they were to educate the students for complete living.

Industrial Arts in the Public Schools. If any area of the school curricula is to survive, it must have the support of school administrators, teachers and the public. Although industrial arts was lacking in this support when in its infancy, it has gained the support of administrators in increasing numbers throughout the United States. The following is a statement made by Newkirk and Johnson.

> Today, in all sections of the country, school administrators are meeting the need for well-rounded education by making industrial arts an important subject at all grade levels. If children are to receive an education that will be satisfying to them in their future living, educators must supply those subjects that will lend themselves to the all-round growth of the individual. Industrial arts is an important part of general education for boys and girls. (10 A, page 5)

From this statement it is evident that industrial arts is invading the curriculum of all of the grades in the school, in a more organized manner. Industrial arts has the support of the progressive administrators.

In order to better understand the objectives of industrial arts it will be necessary to give some definitions which are accepted by the leaders in the field of industrial arts. The following are definitions that are accepted:

> Industrial arts is the study of materials and of the desirable changes made by hand or by the several manufacturing processes from the raw state into products designed to meet the consumer's needs and comforts for daily living. (10 A, page 5)

> Industrial arts is those phases of general education which deal with industry--its organization, materials, occupations, processes, and products--and with the problems resulting from the industrial and technological nature of society. (14 A, page 2)

> Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes. (13 A, page 16)

From these definitions, which are widely accepted, it may be assumed that industrial arts is a curriculum area that deals with a special phase of our social system. Industrial arts should be taught to boys and girls throughout all of the grades. Although the knowledge gained will aid them regardless of the type of employment they accept, its primary objectives should be for more complete living.

The objectives of industrial arts are essentially the same as those of general education. Newkirk and Johnson give eight general objectives which are as follows:

1. Develop the ability to plan and complete projects, using a variety of tools and construction materials in a workmanlike manner.

2. Give experiences that will increase understanding of modern industry and that will lay the foundation for and help determine vocational interests.

3. Develop the ability to read and make working drawings, charts, and graphs.

4. Develop the ability to recognize quality and design in the products of industry.

5. Develop the ability to maintain and service, in a safe and efficient manner the common products of industry.

6. Provide an objective medium for expression in mathematics, science, language, arts, and social science.

7. Develop an interest in crafts as a valuable medium for creative expression in leisure time.

8. Give experiences that will develop social understanding and

> the ability to work effectively with others either as a leader or as a member of the group. (10 A, page 7)

These objectives are suitable for grades one through twelve. However, the emphasis that is placed on any particular objective will vary with the grade level, type of pupil and the interest of the community. It would be easy to adjust these objectives to any grade level and also to most any type of student because they are general and not specific.

The following is a group of objectives as stated by Wilber:

1. To explore industry and American industrial civilization in terms of its organization, raw materials, processes and operations, products, and occupations.

2. To develop recreational and avocational activities in the area of constructive work.

3. To increase an appreciation for good craftsmanship and design, both in the products of modern industry and in artifacts from the material cultures of the past.

4. To increase consumer knowledges to a point where students can select, buy, and maintain the products of industry intelligently.

5. To provide information about, and--in so far as possible--experiences in, the basic processes of many industries, in order that students may be more competent to choose a future vocation.

6. To encourage creative expression in terms of industrial materials.

7. To develop desirable social relationships, such as cooperation, tolerance, leadership and followership, and tact.

8. To develop a certain amount of skill in a number of basic industrial processes. (14 A, page 43)

Many other objectives and definitions could be given from leaders in the field of industrial arts education. Most of the leaders are in accord as to the general objectives of industrial arts. Some are more progressive than others and stress certain phases of the program. For instance, the

the general shop idea is not accepted by some of the leaders, and teachers in the field. The term, "laboratory of industries" is not accepted by some of the leaders, at least not as Warner would have them accept it.

PART C

A PROPOSED PHILOSOPHY

The general objectives of industrial arts as well as the general objectives of education are not recent. Any one or all of these objectives may be traced to the philosophy of early educational leaders. In fact, industry itself is just about as old as man. Webster says, "Industry is habitual diligence in any employment or pursuit; study attention to business; assiduity." If this definition is accepted, it may be assumed that man has always been engaged in industry. Industrial arts in the schools have progressed along with industry. If industrial arts is to be a program for general education, it must continue to progress and broaden as industry expands into new fields.

Personal Philosophy. The following proposed philosophy are statements which are current in the field of industrial arts and accepted by the leaders. There should be opportunities for the students to explore various phases of industry, especially in the junior high school. The industrial arts program should be broad enough to provide opportunities for using leisure time. It should provide, through related information, opportunities to explore the vocational fields. Especially is this true of students who continue to take industrial arts courses in their senior high school years. The industrial arts courses should give the students an opportunity to "learn by doing," which was the philosophy of Dewey.

Accepted Definitions. The following are definitions which are accepted:

> Vocational-industrial Education is a phase of specific vocational education, designed to train prospective and employed workers for proficiency in industrial vocations. (9 A, page 571)

> Industrial Education. A generic term including all educational activities concerned with modern industry and crafts, their raw materials, products, machines, personnel, and problems. It therefore includes both industrial arts and vocational industrial education. (5 A, page 7)

The above definitions are given so as to clarify the statements in the proposed philosophy.

Conclusion. The philosophy of industrial arts which has been proposed by the writer is in accord with the accepted philosophy of leaders in the field. It is the opinion of the writer that industrial arts contributed as much toward general education as any program of the school curriculum.

CHAPTER IV

ANALYSIS OF DRAWING BOOKS

In the past ten years there have been many books published in the field of drawing. A rapid expansion of industry during the war plus new methods of production have prompted leaders in industry and education to write these books. Not all of the books have been new, some are revised copies giving the latest information on accepted procedures. Many of these books could not be used as textbooks because of their limitations as to subject matter and illustrations. In fact, it would be almost impossible to select any one book which will meet the requirements of a given number of Schools. Local conditions and courses of study are some of the factors to be considered when selecting a book to be used as a textbook.

For a well balanced course of study the students should have access to a variety of drawing books written by different authors. The reason for this is that one author may illustrate and explain one phase of the graphic art better than another. The type of book also limits the information to certain topics. For instance, in Mechanical Drawing written by French and Svensen only twenty three pages are devoted to aircraft drawing while in other books the entire book is devoted to that subject. Therefore if the teachers are going to allow for the individual differences which exist among any group of students, it is necessary to have a wide selection of drawing books covering every phase of the subject. It is with these facts in mind that the writer attempted to analyze all of the books pertaining to the

subject of drawing and published in the past ten years.

PART A

METHODS OF ANALYSIS

Much information has been written on the selection of textbooks for various courses and procedures to be followed in selecting such books. All books which are analysed in this report are analysed primarily for use as textbooks but other factors are considered. These books are not analysed with a particular course of study in mind.

Techniques Used. In analysing the books, a score card and a standards for scoring sheet were used. The score card was divided into six major divisions with a maximum score of one thousand and a minimum of four hundred and two. Each division is divided into sub-divisions of from two to six parts. Each sub-division has a maximum and minimum rating score. The minimum and maximum depending upon the importance of the particular sub-division. The following is a copy of the score card used.

This score card was designed so that any one could use it in analysing textbooks for any course in industrial arts. For uniformity in the use of the score card there is an explanatory sheet which gives information pertaining to each division and sub-division of the score card. This sheet is entitled, "Standards For Scoring Textbooks," and follows the score card.

The standards for scoring sheet give the items to be considered for each division and sub-division. If these items are checked closely in each book there should be a fairly accurate analysis obtained.

SCORE CARD FOR EVALUATION INDUSTRIAL-ARTS TEXTBOOKS

Textbook_____

Author_____ Publisher_____

Date of Publication_____ Grade Level_____

Directions: The items in this score card have been selected as being essential in a textbook. The numbers in the parenthesis represent maximum and minimum values. In the blank to the right of an item you are asked to place the value which you ascribe to that particular item.

1.	LOCAL ADAPTABILITY		110
	A. Supervision	(5, 10, 15, 20) _____	
	B. Teaching	(10, 15, 20, 25) _____	
	C. Boys	(15, 20, 25, 30) _____	
	D. Class	(4, 6, 8, 10) _____	
	E. Equipment	(5, 10, 15, 20) _____	
	F. Term	(2, 3, 4, 5) _____	
2.	SUBJECT MATTER		335
	A. Boy Experience	(20, 35, 50, 65) _____	
	B. Aims	(20, 30, 40, 50) _____	
	C. Individual Differences	(15, 25, 35, 45) _____	
	D. Selection and Balance	(55, 70, 85, 100) _____	
	E. Reliability	(5, 15, 25, 35) _____	
	F. Style	(10, 20, 30, 40) _____	
3.	ARRANGEMENT AND ORGANIZATION		120
	A. Division	(10, 20, 30, 40) _____	
	B. Project Method	(50, 60, 70, 80) _____	
4.	AIDS TO INSTRUCTION AND STUDY		170
	A. Usableness	(25, 40, 55, 70) _____	
	B. Provision for Choice	(25, 40, 55, 70) _____	
	C. Index	(4, 6, 8, 10) _____	
	D. Glossary	(4, 6, 8, 10) _____	
	E. Contents (table)	(4, 6, 8, 10) _____	
5.	MECHANICAL FEATURES		215
	A. Attractiveness	(15, 25, 35, 45) _____	
	B. Illustrations	(45, 60, 75, 90) _____	
	C. Print	(15, 20, 25, 30) _____	
	D. Binding	(10, 15, 20, 25) _____	
	E. Paper	(10, 15, 20, 25) _____	
6.	SPECIAL FEATURES		50
	A. Authorship	(15, 20, 25, 30) _____	
	B. Publisher	(0, 1, 3, 5) _____	
	C. Preface	(0, 1, 3, 5) _____	
	D. Publication Date	(4, 6, 8, 10) _____	
		TOTAL	1000

STANDARDS FOR SCORING TEXTBOOKS

1. LOCAL ADAPTABILITY.
   - A. Supervision. Adapted to the type of supervision. Should be self-directive. Requires minimum of attention on the part of the supervisor. Suited to the course of study likely to be used for a considerable period.
   - B. Teaching. Suited to various types of instruction. Gives special aid to inexperienced teachers. Enables progressive teachers to use initiative.
   - C. Boys. Adapted to needs and ability of boys.
   - D. Class. Suited to size of class, whether large or small. Meets needs of group of poorly classified pupils.
   - E. Equipment. Meets restrictions of a modestly equipped laboratory, a small library and a minimum of supplies.
   - F. Term. Essential material for a short term with extra topics for a longer term.

2. SUBJECT MATTER.
   - A. Boy Experience, Related to. Interests the boy. Builds on original tendencies. Provides for visualization. Allows growth in subject and in life.
   - B. Aims. Is in harmony with accepted general aims. May be adapted to laboratory, library, or recitation methods.
   - C. Individual Differences, Provides for. Offers material for slow, gifted and normal pupils.
   - D. Selection and Balance. Are they recognized: (1) in amount given to a topic, (2) in selection of essential topics, (3) in repetition of vital facts when needed, and (4) in elimination of unnecessary repeating especially in series of books?
   - E. Reliability. Facts accurate and up-to-date. Material from authentic sources.
   - F. Style. Language and diction suitable for grade or class. Simple in earlier years, gradually increasing in sentence and word difficulty. Emphasizes short sentence. Language figurative and vivid where possible.

3. ARRANGEMENT AND ORGANIZATION.
   - A. Divisions. Divided carefully into chapters, sections, and paragraphs, each attractively set off in bold-faced type, larger letters, or special print groupings. Divisions characterized by unity and continuity. Lessons have aims that are clear and definite.
   - B. Project Method. Adapted to this method. Material topically grouped. Easily correlated with other branches. Provides for unit studies. Applications suggested or presented and carefully distributed through text.

4. AIDS TO INSTRUCTION AND STUDY.
   - A. Usableness. Questions thought provoking and relevant. References well selected and annotated. Exercises useful and bearing on text. All planned with a view to purposeful activity.

B. Provision for Choice. Sufficient number. Variation in difficulty and interest.
C. Index. There should be an adequate index, and where possible a list of difficult pronunciations, or words, parenthetically pronounced.
D. Glossary.
E. Contents. Table of contents complete enough to permit ready location of important topics.

5. MECHANICAL FEATURES.
A. Attractiveness. Color suitable, not easily soiled, design harmonious. Size convenient.
B. Illustrations. Adequate in number, useful, appealing to pupil, full of action when possible, well-executed, explanation in detail.
C. Print. Proper size for grade.
D. Binding. Durable and flexible, not easily broken.
E. Paper. Good weight, good quality, surface unglazed.

6. SPECIAL FEATURES.
A. Authorship. Author prominent as educator, authority on subject.
B. Publisher. Reliable, of good standing and reputation.
C. Preface. Serves real use. Gives general plan of book.
D. Date of Publication.

Books Used for the Study. The books used in this analysis are books published since 1940. All of these books pertain to some phase of the graphic art. The following is a list of the books analysed:

1. Anderson, Newton H., Aircraft Layout and Detail Design, McGraw-Hill Book Company, Inc., New York, 1946, 437 pages.

2. Audel (Theo.) and Company, Audel's Mechanical Drawing Guide, Audel and Staff, New York, 1947, 126 pages.

3. Brodie, Harold J., Engineering Drawing and Mechanism, Harper and Brothers, New York, 1942, 241 pages.

4. Carini, Louis Frank Bartholomew, Drafting for Electronics, McGraw-Hill Book Company, Inc., New York, 1946, 211 pages.

5. Coover, Shriver L., Workbook in Mechanical Drawing, an Introductory Course, McGraw-Hill Book Company, Inc., New York, 1947, 201 pages.

6. Farmer, J. Harold, Illustrating for Tomorrow's Production, The Macmillan Company, New York, 1950, 203 pages.

7. French, Thomas Ewing, A Manual of Engineering Drawing for Students and Draftsmen, McGraw-Hill Book Company, Inc., New York, 1947, 694 pages.

8. French, Thomas E., A Manual of Engineering Drawing, McGraw-Hill Book Company, Inc., New York, 1941, 622 pages.

9. French, Thomas E., and Svensen, Carl L., Mechanical Drawing, A Text With Problem Layouts, McGraw-Hill Book Company, Inc., New York, 1948, 437 pages.

10. Giesecke, Frederick E., Mitchell, Alva, and Spencer, Harry C., Technical Drawing, The Macmillan Company, New York, 1949, 851 pages.

11. Groneman, Chris Harold, Exploring the Industries, The Steck Company, Austin, Texas, 1944, 160 pages.

12. Hayes, J. T., and Pain, H. W., Shop Sketching and Blue Print Reading Made Easy, Technology Text Company, Cincinnati, 1947, 140 pages.

13. Hess, Herman Carl, A Manual in Engineering Drawing, The Macmillan Company, New York, 1942, 118 pages.

14. Hoelscher, Randolph Phillip, Springer, C. H., and Pohle, R. F., Industrial Production Illustration, McGraw-Hill Book Company, Inc., New York, 1943, 172 pages.

15. Hoelscher, Randolph Phillip, and Mays, Arthur B., Basic Units in Mechanical Drawing, J. Wiley and Sons, Inc., New York, 1944, 305 pages.

16. Johnson, William Harding, and Newkirk, Louis V., Modern Drafting, The Macmillan Company, New York, 1944, 197 pages.

17. Jones, Franklin Day, Mechanical Drawing, The Industrial Press, New York, 1941, 342 pages.

18. Katz, Hyman H., Aircraft Drafting, The Macmillan Company, New York, 1946, 386 pages.

19. Katz, Hyman H., Technical Sketching and Visualization for Engineers, The Macmillan Company, New York, 1949, 163 pages.

20. Kenison, Erving, McKinney, James, and Plumrige, Tom C., Mechanical Drawing, American Technical Society, Chicago, Ill., 1947, 330 pages.

21. Linsley, A. T., How to Draw Technical Illustrations, The Studio, New York, 1948, 64 pages.

22. Meadowcroft, Norman, Aircraft Detail Drafting, McGraw-Hill Book Company, Inc., New York, 1942, 211 pages.

23. Nelson, William, Airplane Lofting, McGraw-Hill Book Company, Inc., New York, 1941, 147 pages.

24. Nicholson, Frederick Samuel, Mechanical Drawing, D. Van Nostrand Company, New York, 1946, 211 pages.

25. Orth, Herbert Denny, Basic Engineering Drawing, Irwin-Farnham Publishing Company, Chicago, Ill., 1946, 346 pages.

26. Quier, Kenneth Elwell, Engineering Drafting Problems, Harper and Brothers, New York, 1944, 80 pages.

27. Schuman, Charles Henry, Technical Drafting, Harper and Brother, New York, 1940, 793 pages.

28. Shaeffer, Glenn N., Basic Mechanical Drawing, The Bruce Publishing Company, Milwaukee, 1946, 89 pages.

29. Starbuck, Robert Macy, Drawing and Blue Print Reading for the Plumber and Fitter, R. M. Starbuck and Sons, Inc., Hartford, Conn., 1948, 156 pages.

30. Svensen, Carl Lars, A Manual of Aircraft Drafting, D. Van Nostrand Company, New York, 1941, 272 pages.

31. Svensen, Carl L., Machine Drawing, D. Van Nostrand Company, Inc., New York, 1945, 280 pages.

32. Sykes, F. W., Drawing and Development for Practical Welding, Sir Pitman and Sons, Ltd., London, 1944, 72 pages.

33. Tharratt, George, Aircraft Production Illustration, McGraw-Hill Book Company, Inc., New York, 1944, 201 pages.

34. Thayer, Horace Richmond, Blue Print Reading and Sketching, McGraw-Hill Book Company, Inc., New York, 1941, 141 pages.

Procedures Used in Analysing Each Book. It would be impossible to check each topic, section or chapter of all of the books thoroughly. The writer spot checked each book, by selecting one or more topics, sections or chapters and checking this material closely with each division or sub-division on the score card. Certain points were checked fairly close in all of the books. The points checked in every book were: preface, table of contents, glossary, illustrations, type of paper, and index.

From one to two hours were spent checking each book and it is realized that this is not enough time if the book is to be checked closely.

However, by checking sections of the various books at random one can get a fairly accurate analysis of a book. For instance, if orthographic projection is being analysed, the amount of material related to the subject as well as the quality of the material and methods of presenting the material may be checked very close in a minimum of time. The language, diction and methods of illustrating problems can also be checked with a fair degree of accuracy in a limited amount of material such as found in a section or chapter.

It was assumed by the writer that if one section of the book was well presented that all sections would be equally well presented. However, this would not be true in all cases.

PART B

THE RESULTS OF THE STUDY

The results of this study should not be considered as conclusive because of the many factors involved in evaluating a text. The study would have been more accurate and complete if the books were analysed by several people and the total score averaged. A table is used to show the comparative rating of all of the books. The rating score could range from four hundred and two to one thousand. Therefore a book with a total score of seven hundred would be average according to the comparative study.

Methods Used in Reporting Study. In reporting this study a table (Table 1), is used giving the author, title of the book, total score for each division and a total score of all of the divisions. These books are listed alphabetically according to the author. Each sub-division has been omitted in the table. However, one can arrive at a comparative rating

from each of the six main divisions given.

Ten books which rated the highest among the thirty four analyzed were selected for making a page analysis. In making the page analysis twenty five topics were selected which should be in every drawing book. The number of pages in each book devoted to a particular topic was counted and tabulated as shown in Table 2. After the tabulation of each book was made a total tabulation for all of the books was made and the percentage space allotment for each topic was figured. The results are shown in Figure 1. The column on the left represents the results of this study and the column on the right is the results of a previous study. (2 C, page 112)

The Results of the Study. Drawing books published in the past ten years rate above average according to the methods used in scoring the books. There seems to be more emphasis placed on sketching and aircraft drawing in the post war years.

In the page analysis orthographic projection and working drawings were separated. The pages tabulated as working drawings were the ones which explain the details of the working drawings and orthographic projection were the pages containing information about the theory and principles of projection.

As the table indicates orthographic projection occupies the major portion of space with working drawings, machine drawing, and aircraft drawing following in the above order.

The page analysis to the several topics may not be a good criterion by which to judge the quality or value of a textbook, however it does, to some extent, indicate the value each author gives to a topic. This information will also show each author's major emphasis, his methods of teaching and his training.

EVALUATION

TABLE I

Title	Local Adaptability	Subject Matter	Arrangement and Organization	Aids to Instruction and Study	Mechanical Features	Special Features	Total
AIRCRAFT LAYOUT AND DETAIL DESIGN Anderson	87	265	110	132	175	41	810
AUDEL'S MECHANICAL DRAWING GUIDE Audel and Company	92	240	80	96	140	37	685
ENGINEERING DRAWING AND MECHANISM Brodie	83	220	90	115	130	28	666
DRAFTING FOR ELECTRONICS Carini	86	230	90	117	170	41	734
WORKBOOK IN MECHANICAL DRAWING, AN INTRODUCTORY COURSE Coover	83	205	80	96	125	36	625
ILLUSTRATING FOR TOMORROW'S PRODUCTION Farmer-Hoecker-Vavrin	79	265	100	124	215	48	831
A MANUAL OF ENGINEERING DRAWING FOR STUDENTS AND DRAFTSMEN French	103	305	110	162	165	48	893
A MANUAL OF ENGINEERING DRAWING French	110	275	100	151	150	42	828
MECHANICAL DRAWING, A TEXT WITH PROBLEM LAYOUTS French-Svensen	114	310	100	162	210	50	946

Table I (Continued)

Title	Local Adaptability	Subject Matter	Arrangement and Organization	Aids to Instruction and Study	Mechanical Features	Special Features	Total
TECHNICAL DRAWING Giesecke-Mitchell-Spencer	100	320	120	170	180	45	935
EXPLORING THE INDUSTRIES Groneman	88	240	90	111	160	33	722
SHOP SKETCHING AND BLUE PRINT READING MADE EASY Hayes	77	205	100	111	140	39	672
A MANUAL IN ENGINEERING DRAWING Hess	90	195	90	109	135	29	548
INDUSTRIAL PRODUCTION ILLUSTRATION Hoelscher-Springer-Pohle	90	275	100	94	150	37	748
BASIC UNITS IN MECHANICAL DRAWING Hoelscher	90	285	110	147	175	39	846
MODERN DRAFTING Johnson-Newkirk	110	315	110	159	205	46	945
MECHANICAL DRAWING Jones	100	265	110	130	165	32	802
AIRCRAFT DRAFTING Katz	104	290	100	132	210	48	834

Table I (Continued)

Title	Local Adaptability	Subject Matter	Arrangement and Organization	Aids to Instruction and Study	Mechanical Features	Special Features	Total
TECHNICAL SKETCHING AND VISUALIZATION FOR ENGINEERS Katz	100	300	100	151	215	48	914
MECHANICAL DRAWING Kenison-McKinney-Plumrige	99	240	100	115	215	48	717
HOW TO DRAW TECHNICAL ILLUSTRATIONS Linsley	76	220	80	96	190	31	693
AIRCRAFT DETAIL DRAFTING Meadowcroft	74	225	70	115	145	32	661
AIRPLANE LOFTING Nelson	97	255	100	130	175	34	801
MECHANICAL DRAWING Nicholson	103	310	120	153	205	43	934
BASIC ENGINEERING DRAWING Orth	97	295	110	166	170	41	879
ENGINEERING DRAFTING PROBLEMS Quier	83	230	80	94	130	27	644
TECHNICAL DRAFTING Schuman	98	275	110	166	180	39	868
BASIC MECHANICAL DRAWING Shaeffer	76	160	80	79	150	26	571

Table I (Continued)

Title	Local Adaptability	Subject Matter	Arrangement and Organization	Aids to Instruction and Study	Mechanical Features	Special Features	Total
DRAWING AND BLUE PRINT READING FOR THE PLUMBER AND FITTER Starbuck	109	325	110	126	175	39	884
A MANUAL OF AIRCRAFT DRAFTING Svensen	95	275	120	145	195	44	874
MACHINE DRAWING Svensen	102	290	120	119	190	39	860
DRAWING AND DEVELOPMENT FOR PRACTICAL WELDING Sykes	75	215	80	100	140	37	647
AIRCRAFT PRODUCTION ILLUSTRATION Tharratt	102	300	110	160	205	39	916
BLUE PRINT READING AND SKETCHING Thayer	81	195	90	98	135	30	629

TABLE III

PER CENT OF SPACE ALLOTTED TO THE SEVERAL TOPICS IN THE TEXTBOOKS ANALYSED

Topic	Per cent of Space Allotted	Brown's Study
Aircraft drawing	6.4	
Architectural drawing	3.7	3.9
Contents (table)	.5	
Decimal equivalent, symbols and tables	.1	
Design and color	1.4	
Duplicating	1.6	
Electrical drawing	.08	.3
Equipment and use of tools	6.7	7.5
Foreword and preface	.5	
Graphic solutions	1.4	
Graphs, charts, diagrams and maps	2.8	
Index	2.0	
Introduction, definition and uses	.9	
Lettering	3.9	4.0
Machine drawing	7.9	15.7
Measuring and dimensioning	6.3	
Orthographic projection	13.0	29.4
Pictorial drawing	5.5	5.4
Piping drawing	1.1	1.

Table III (Continued)

Topic	Per cent of Space Allotted	Brown's Study
References and related information	1.9	
Sheet metal and surface development	3.6	3.1
Sketching	2.6	2.3
Structural drawing	1.7	.3
Welding drawing	1.7	
Working drawing	8.0	

CHAPTER V

SUMMARY AND CONCLUSIONS

Textbooks are teaching aids which help the teacher in presenting a course of instruction. It is impossible for a teacher to present a balanced course of instruction without the use of a textbook. Where possible there should be several books for references. This gives the student an opportunity to broaden his knowledge of a particular subject by comparing the views of various authors. In analysing a textbook there should be specific objectives in mind if the best analysis is to be made. In this report a more general analysis was made and some of the books having a low rating might prove to be valuable in certain courses of study.

Summary. In the general analysis as shown in Table I twenty three of of the thirty four books rated above average. This indicates that even though a large number of drawing books have been published in the last decade they are high quality books written by well known authors and are needed in order to keep abreast with the changes being made in industry.

As for trends in the amount of space devoted to selected topics Table III indicates that orthographic projection and working drawing have the lead which has been the case in previous studies. Machine drawing is second and electric drawing is given the least amount of space. The two topics which have gained in amount of space are aircraft drawing and sketching. However, aircraft drawing has made greater gains than sketching.

Conclusions. It is realized by the writer that a more accurate analysis could have been made if each book had been analysed by several different persons and the average taken. There was also a lack of time for analysing each book thoroughly. However, the analysis is sufficient to indicate the general trends in drawing textbooks. The number of drawing books published in recent years indicates the importance of drawing in the industrial arts curriculum.

APPENDIX

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