PHOTOGRAPHY IN INDUSTRIAL ARTS

by

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CHAPTER I

AN INTRODUCTORY STATEMENT

The curriculum of the industrial arts department is one of the greatest sources for introducing livelihoods and hobbies to the future citizens of any country or generation. This gives the student the chance to explore many different fields of interest and may influence a way of earning a living or merely serve as an introduction to a hobby.

The teaching of photography in industrial arts as one of the graphic arts is very benificial in that it involves the knowledge of several fields of education to completely process film to produce a picture.

The use of photography in teaching safety in the shop may be very important in the prevention of accidents. With a number of tools available in the shop a course in photography may be taught at a minimum of expense.

Purpose of the Study. This particular subject was selected because the amount of interest it will arouse in students. Photography has become so popular in recent years that the home darkroom is becoming a necessity.

This study has been made to be used as a guide and a reference for developing and printing of pictures by the amateur. It is not intended to be an encyclopedia of photographic information.

Research Technique Used. The information obtained for this study was through the historical technique of research. The library has a large number of books available that may be used, but no attempt will be made here to name each book. The names of the books used in this study will be listed in the selected bibliography. There are many manufacturers of photographic supplies that have literature available; much of which is free for the asking.

Scope of Study. Chapter two is divided into two parts, giving a brief history of industrial arts, and of photography. Chapter three gives the complete photographic process in the making of a picture. Chapter four is a suggested course outline to be used as an aid to the instructor. Chapter five gives the conclusions and recommendations for further study relative to this study.

Definitions of Terms. In the search for information, regardless of the subject, there will be a need for explanation of terms. To clarify a vocabulary for industrial arts and photography, it is necessary for the following terms to be defined.

> Manual Training. Manual training is a systematic study of tools, processes, and materials to enable those who have no career in mind to discover their inborn capacities. (1, p. 13)

> Industrial Arts. The industrial arts are those occupations by which changes are made in the forms of materials to increase their values for human usage. (1, p. 38)

> Industrial Education. A generic term including all educational activities concerned with modern industry, its raw materials, products, machines, personnel, and problems. It, therefore, includes both industrial arts, the general education forerunner of our introduction to vocational industrial education and the latter also. (6, p. 7)

Photography. The art of obtaining the representation of objects by the agency of light upon sensitive substances. (18, p. 458)

Acid Fixing Bath. The use of a sulphite and a free acid in the fixing bath for negatives to remove the yellow tint. (18, p. 5)

Bromide Paper. Paper coated with an emulsion of silver bromide in gelatine, with or without other silver haloids, and intended for obtaining prints by development either by contact printing or enlarging with daylight or artificial light. (18, p. 77)

Emulsion. Photographically, a mechanical mixture of any sensitive salt of silver in extremely minute division, held in suspension in any viscous vehicle, such as gelatine or collodion. The emulsion may be either for the production of negatives, transparencies, positives, slides, for development or printing out papers. (18, p. 217)

Filter. A filter is a screen. It permits only the desired light rays to enter a lens. (16, p. 220)

Daguerreotype. An early process for obtaining a camera picture; invented by a man named Daguerre. (18, p. 169)

Development. Development is the production of a visible image from an invisible impression. (18, p. 177)

Collodion. The vehicle used in wet-plate processes for holding the haloid salts necessary for the formation of the sensitive film. (18, p. 130)

Halation. A blurring of the image and an encroachment of the high lights upon the surrounding shadows or darker protions. It is caused by the reflection from the back of the plate. (18, p. 338)

Hypo. An abbreviation for Sodium Hyposulphite, used to harden the image. (18, p. 348)

Image. In optics a simulation of an object--real when it can actually be received on a screen, as a camera image; virtual when the eye sees it as in the prolongation of bent rays entering the eye. (18, p. 350)

Intensification. The increasing of the deposit or the printing density of a negative. (18, p. 363)

Printing. This term is applied to any method by means of which a positive is obtained from a negative, so that a picture is obtained in which to some extent at least the gradations of light and shade are represented as seen in nature. (18, p. 501)

Printing Frame. The specially made frame--generally of wood--for holding the photographic negative while the print is being made. (18, p. 505)

Lens. An optical term given to discs of glass bounded generally by two spherical surfaces, or by a plane and a spherical surface. (18, p. 390)

Safe-Lights. Colored screens or glasses for the dark-room light. (18, p. 527)

Focal Plane. This is the position at the back of the camera usually occupied by the focussing screen and then by the plate or film. It is the plane on which the image made by the lens is brought to the sharpest focus. (18, p. 299)

Screw Mount. Term applied to lenses or filters which screw into camera and lens, respectively. (16, p. 388)

Bayonet Mount. A device used on some cameras to facilitate the exchange of lenses. Lens has prongs fitting into the camera, and a lever locks them in place from within. (16, p. 380)

Cartridge Film. A roll of sensitized film wound on a metal spool, the roll being encased in a metal casing for protection against light and dampness. (16, p. 381)

Detail. In pictorial photography, detail includes everything which does not contribute to the motif of the photography. (16, p. 382)

Under-Exposure. When the duration of exposures of the sensitive surface is not sufficiently prolonged to impress the detail of the object on the sensitive surface. (18, p. 607)

To properly teach photography in industrial arts the teacher should have, as a minimum, a fair trade or technical background. The history of any subject to be taught is very important to the instructor. The following chapter is a brief history of industrial arts, and of photography; giving some of the leaders responsible for the development of each.

CHAPTER II

A BRIEF HISTORY OF INDUSTRIAL ARTS AND PHOTOGRAPHY

To understand fully any subject it is well to know the background of that subject. It is the writer's intention, in this chapter, to present some of the leaders in both industrial arts and photography. Some of the outstanding dates and periods of time will also be reviewed to show the progress these two subjects have made in civilization.

PART A

History of Industrial Arts

Because of the lack of written records there is much speculation as to the earliest forms of industrial education. It is known that industrial education is as old as the human race. The first use of industrial education was to obtain food, clothing, and shelter. Today, the same items are the chief interest to civilization, but the methods of obtaining them are much more refined.

Unconscious Imitation. The savage was driven by hunger to seek food, and by the cold or heat to devise clothing, and a shelter for himself and his family. Skill of hand in the making and using of weapons became more valuable than mere physical force in the protection of the family and in obtaining

food. This type of education was merely unconscious imitation through the social life of the family, tribe or group. (2, p. 11-12)

Conscious Imitation. When man gained the power to control fire he passed into another stage of civilization; from savagery to barbarism. With the use of fire the barbaric type of people were able to make tools and engage in crafts of their choice. The process of imitation became conscious, but still there was no formal system of instruction.

Apprenticeship. There is good reason to link the discussion of early forms of imitation of the savage to that of apprenticeship. In reality modern industrial education can be traced to its ancient ancestor. Apprenticeship training dates back to the ancient civilizations in Babylon, and more recent references to it are found in writings of the Greeks. The term apprenticeship is commonly associated with a contract, either written or implied, for service to be rendered. This service takes the form of instruction on the part of the master and learning through working on the part of the learner. "Apprenticeship is not limited to trade and industrial pursuits. It is much broader than that in its scope; it includes all sorts of vocations and the professions as well." (15, p. 2)

The Guilds. The craft guilds established apprenticeship education during the Dark Ages when other forms of education were almost non-existent and eventually developed a new point of view toward everything included in the word "learning". The guilds of the Middle Ages were fraternities, societies,

or companies organized for several purposes. The guilds of the Middle Ages are considered the forerunner of the modern-day unions. The craftsmen in this age established guilds of their own. The guilds promoted quality in work, and poor workmanship was not tolerated. Persons who persisted in it were excluded from the craft guilds. "The guilds rendered important service to their members in that they provided the only education that was abailable during a time when learning in its various form was at a low ebb." (15, p. 6)

There were times in Europe as well as in America, when apprenticeship was unjust. It was very undesirable when the apprentice was treated like a slave. On the other hand apprenticeship training served exceedingly well the educational requirements during several centuries of political, religious and social unrest. With the guilds becoming overregulated over the centuries, and with so many controls over the apprentice, there came a movement which was known as the industrial revolution.

The Industrial Revolution. The beginning of the period of the industrial revolution in England is usually placed at about the year 1750. Shortly after that time a series of important inventions and discoveries were made which revolutionized industry. This period coincides roughly with the decline of the old guild type of apprenticeship. The industrial revolution came later in America than in England. The year 1812 saw manufacturing getting well started in the United States, but it was not until after the civil war that industry really boomed.

The Manual Labor Movement. The manual labor movement in the United States was organized by Joseph Neef and William Maclure in 1820. This movement was a plan to introduce manual instruction into the schools on the basis that pupils would work, under school supervision, for about half of the day, and would receive academic instruction during a part of the remaining time. (15, p. 16)

There was much discussion in those days not only as to whether or not manual instruction should be taught in the schools, but the whole matter of public support for high schools was an unsettled question.

The Morrill Act. The Morrill Acts were passed in 1862 establishing the Land Grant Colleges of the United States. The whole idea behind this act was to train individuals in one school or in one kind of work and let it carry over to all other fields. Specific trades were not taught, but instead, general training was emphasized. In those days there was no differentiation in vocational training of secondary schools and that of college engineering and research work. In the latter years of the nineteenth century, manual training developed, in response to the ideas held by educators of that period, that general industrial education was desired as a part of the public school curriculums.

The Russian System. The Russian system of trade and industrial education became the Imperial Technical School in 1868. This system of education was introduced to America in 1876 in Philadelphia. This system of education provided a pattern for what eventually became manual training in America.

The Sloyd System. This system was introduced in America at approximately the same time as the Russian system. The Sloyd system was developed by Saloman through using wood carving to introduce the training in the use of tools. Out of these two systems there came a new term which was known as manual training.

Manual Training. Calvin Milton Woodard was responsible for the introduction of instruction in handicrafts into the secondary schools as a part of the general education program for all boys. Under his leadership the first manual training school in the United States was organized and erected in St. Louis, June 6, 1879. During the first half of the 1880's Woodard and other leaders contributed to the establishment of manual training schools in Baltimore, Chicago, Cleveland, Philadelphia, and Toledo.. In all but Baltimore, the schools were established by private means and equipped by wealthy businessmen.

Manual training had many objectives. In general these centered around the ideas of providing manipulative experiences for their beneficial effect upon a curriculum that was almost exclusively book work. Among the desirable influences that manual training has exerted upon comtemporary educational practice are:

1. It has helped to introduce interest into the curriculum by emphasizing life problems. It has helped to change our schools from "learning" schools to "life" schools.

2. Greater opportunity, than formerly existed, was given to creative thought on the part of the pupils, thus stimulating the development of originality and initiative in learners.

3. Greater freedom of thought, of expression, of school discipline and of attitude of pupils to teacher resulted from the new venture in education. Both teachers and pupils were made more free from old traditional bonds of restraint that governed classroom procedure.

4. Manual training provided some exploratory, self-discovery opportunities for pupils. It gave them some, though often but a limited, appreciation of how men labored in various great industrial enterprises. (15, p. 33)

Out of the early forms of manual training there has gradually evolved an enlarged and enriched subject known as manual arts.

Manual Arts. Manual arts and manual training are closely related. Manual arts came into use to express emphasis on the art side of manual training. The purpose here was to provide more creative art work rather than mere physical labor in shop work. Out of all of this there came still another term; that of "Industrial Arts".

Industrial Arts. In 1904, Charles Russell Richards advocated the changing of the name manual arts to the term industrial arts. He was very successful in getting people to use the term, industrial arts. Industrial arts was considered a representative of industry in a student's life. This was the greatest change yet, because of the changing of physical skill to that of the machine age. With the use of machines in the shops there was a direct relationship between the school and industry. Industrial arts was a great social leveler. Here youth of all social groups met in interesting and instructive environment.

History of industrial arts cannot be fully expressed without mentioning some of the educational people who have, through

their educational philosophies, done much to further the progress of industrial arts in the United States. A brief statement will be presented of the contributions of some of these leaders in education.

Frederick Gordon Bonser. Frederick Bonser was born in 1875, in central Illinois. Bonser was never a teacher in industrial education, neither did he have any direct connections with the field but he is considered one of the great leaders in industrial arts. This may be attributed to the fact that he was of great influence to other leaders through his superior intelligence.

Ira Samuel Griffith. Griffith was born in 1874 in Kansas. Unlike previous named leaders, Griffith took an active part in teaching all phases of industrial arts. He was very active in the writing of textbooks. It was his belief that the training acquired in schools determined the success of the student when he entered industry.

In the book, Leaders in Industrial Education, William T. Bawden has this to say about Griffith:

> One of the significant projects engaging his attention was a study of methods and procedures for giving to senior high school boys some practical insight into the management and leadership problems of the men occupying the minor executive positions in industry. (1, p. 68)

This fairly well summarized what Griffith was trying to do with industrial arts in regard to preparation for industry.

John Daniel Runkle. John Runkle was born in New York in 1822. During a two year tour of Europe, Runkle became interested in industrial arts through studying the Russian exhibits.

Out of this he drew up what he called a philosophy of education, in which a series of resolutions were derived;

1. The single aim of public education should be the physical, mental, and moral training of the young, by all suitable means and agencies; and no study or discipline which is not adapted to these ends for all pupils should be introduced into the public schools and supported at the public expense.

2. While the training of the mental faculties must always be the first and distinct aim of all education, still this training is most effective when all the senses are most fully brought into play as factors in the general process.

3. We believe that hand instruction, no matter of what kind, if adapted to the age of the pupil and properly conducted, can be made disciplinary, and a valuable adjunct to the purely literary studies.

4. We believe that hand study, requiring not more on the average that one hour per day, can be introduced into the public schools without impairing the educational value of the studies now taught, and with no abridgment of the time now devoted to them which will not come through better methods of teaching, or on other grounds.

5. We believe that a workshop, as part of the apparatus of a public school, is as desirable as a science laboratory is to the technical school or college.

6. It is the deliberate opinion of this association that the time has come when handwork should be taught to the proper extent in all public schools, both because of its educational value, and because the social and industrial conditions have so changed as to make such teaching necessary. (1, p. 75)

This series of resolutions were drawn up by Runkle for presentation to the annual convention of the American Institute of Instruction in 1884.

William Elmer Roberts. William E. Roberts was born in Massachusetts in 1866. Roberts is credited with the development of industrial arts in the junior high school. Through his work in industrial arts came an understanding of the

organization and administration of the junior high school.

Ferdinand Theodore Struck. F. Theodore Struck was born in Germany in 1886. Struck's greatest contribution to industrial education was through the preparation of teachers. He is responsible in large part to the in-service training courses for trade and industrial teachers.

Objectives of Industrial Arts Education. One of the strongest criticisms directed against the industrial arts is the lack of agreement as to acceptable objectives of the industrial arts program. Each subject taught in a public school must have its own set of objectives. The following list is that of Gordon O. Wilbur:

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 vocational 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 culture of the past.

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

5. To provide information about and insofar as possible, experiences, in the basic processes of main 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. (19, p. 42)

Almost any aim may be made an objective. To state objectives will not complete the task. There must be a definite and functional means of realizing the objectives if the place of an industrial arts program is to be justified in the educational setup. All objectives should be imbedded and organized into the course of study and they must be used.

It has been the purpose in the foregoing pages to give a brief history of industrial arts, how it was organized, some of the leaders, and the objectives of industrial arts. In the next part of chapter two will be a brief history of photography, the men responsible for the development of it, and some of the most significant dates.

PART B

A Brief History of Photography

Photography is probably the most universal type of communication in the world today. Everyone likes to look at pictures, and they understand them. It is often said, "It would take a thousand words to say what one picture will tell". Photography, compared with the age of civilization, is a fairly recent discovery.

The Camera Obscura. The term "camera obscura" simply means, a dark box. It is a gadget consisting of a light-tight box with a mirror, a ground-glass or parchment screen, and a pinhole or lens. It was used by artists many years before the camera was invented. The inventor of the camera obscura is unknown. The principle of the camera was probably noted thousands of years ago. For centuries no one did anything about

capturing the image, and many failed before it was actually done.

The Lens. The first lens was used in 1568. Daniella Barbaro, a Venetian nobleman, used a convex spectacle lens to form an image. The lens first use was to project a scene on a wall, then sketch it by hand. For a couple of centuries, a number of men tried to fix the image but no one succeeded until the nineteenth century.

Joseph Nicephore Niepce. Niepce is believed to be the first man to preserve an image. No authenticated example of his camera work remains today, but his letters and eyewitness accounts leave no doubt that, between 1816 and 1829, the fixing of the image was a success. During the time that Niepce was experimenting with the camera, another Frenchman was also working along the same channels. The other man was named, Louis Jacques Mande Daguerre. The two men communicated with each other for years before finally becoming partners in 1829. The two men worked together on an experiment with silver plates coated with silver salts, until the death of Niepce in 1833. It was the attempt of the two men to speed up the developing process, because up until this time the pictures made by Niepce needed about a sever-hour exposure. This is the logical reason why no picture ever appeared of Niepce.

Louis Jacques Mande Daguerre. Daguerre, who was a painter by trade, continued the experiments after the death of Niepce. While working with iodized silver plates Daguerre accidentally discovered that fumes of mercury from an open container in his cupboard had developed the invisible image of exposures he had

taken the day before. In 1837, Daguerre made a detailed picture of a corner of his studio using a modification of Niepce's invention which he considered sufficiently his own to name the picture, the daguerreotype.

Daguerreotype. The daguerreotype was made on a sheet of copper that had a sensitized substance coating it. The sheet was exposed to light with the aid of the camera obscura then developed with fumes of mercury. This type of photography has no negative in which to reproduce the positive. The daguerreotype is the positive itself.

The Negative. William Henry Fox Talbot is credited with the perfection of the first negative. Up until this time all pictures were positives. In 1839, Talbot found a way of printing pictures on white paper coated with silver chloride. With this discovery, it was possible to reproduce as many pictures as desired.

The Alchemists. The alchemists began a search in the sixteenth century for ways of converting base metals to gold, and for an elixir of life to make men immortal. They found neither, but did discover silver nitrate which darkened in the sun. From this discovery derived the photographic film and paper of today. The alchemists also learned to make better lens for cameras.

Sir John Herschel. Herschel was a British astronomer, who discovered in 1819 that hypo was a solvent of silver salts. He also made the first silver chloride printing paper and introduced the words, photography and photograph. (16, p. 7)

Wet Collodion. Collodion is made by dissolving guncotton in alcohol and ether. It was first base film used on glass plates. It adhered well to glass, and could be sensitized. The wet collodion plates were first used in 1851 by Frederick Scott Archer. Potassium and iodine were added to the collodion and then dipped in a solution of silver nitrate. The plates had to be exposed immediately after being coated, and developed within a few minutes after exposure. With this process, the photographer had to carry a chemistry set around with him. The inconvenience of this type of plate, for photography, brought about the need for a dry plate.

The Dry Plate. Dr. R. L. Maddox, of London, first produced the dry plate in 1871 by substituting gelatin for collodion. Charles Bennet further improved the dry plate by cooking the gelatin emulsion and thereby increasing the sensitivity. The year of 1878 marked the end of the wet plate. The dry plate was used extensively, and was marketed by George Eastman in 1880.

Roll Film. The first roll film was marketed by Eastman, but it was not of the transparent type. Eastman's film was a paper film coated with a layer of soluble gelatin, which was in turn coated with the emulsion. The emulsion was later stripped from the paper base for use as a negative. Hannibal Goodwin, an American clergyman, was the first to patent, in 1887, the invention of the modern transparent roll film.

Below is a list of significant dates in the evolution of photochemistry.

The Evolution of Photochemistry

Date	Inventor	Achievement
1568	Daniella Barbaro	The first lens was used.
1721	Johann Schulze	The use of light sensitive materials.
1816-1829	Joseph Niepce	Fixing of the image.
1819	John Herschel	Hypo was discovered.
1839	Louis Daguerre	The beginning of photography.
1839	William Talbot	The invention of the first negative.
1841	Joseph Petzval	The first fast protrait lens.
1851	Frederick Archer	The wet collodion plate.
1871	R. L. Maddox	The first dry plate.
1873	H. W. Vogel	Orthochromatic color film.
1878	Charles Bennet	Cooked the dry plate to increase sensitivity.
1880	George Eastman	The marketing of dry plates.
1887	Hannibal Goodwin	The first transparent film.
1902	Paul Rudolph	The most popular lens ever to be made. (Zeiss Tesser)
1904	E. Konig	Panchromatic film
1935	Leopold Godowsky	Kodachrome
1939-1940	Hawley Cartwright	A system for coating lens.
1940	Douglas Winnek	Three dimensional photography.
1957	Andrew Azan	New light sources for printing.

The logical explanation to the slowness in the development of photography may be attributed to the lack of communication. The followers in France did not know what was going on in

England and visa versa. Had the men of the different nations been able to communicate with one another, no doubt the development of photography would have come about much sooner.

This has been a brief history in the development of photography. Some of the men responsible for it and some of the significant dates have been mentioned. In the following chapter a discussion of the photographic process will be given. The cycle that the film goes through before it becomes a picture will be discussed. The following chapter may be used as a guide in processing of film through the chemistry of photography.

CHAPTER III

THE PHOTOGRAPHIC PROCESS

The use of pictures are better than words in conveying a concept, because they do it in less time, more accurately, and more vividly. Pictures are a universal language because they are understood by all people of all time. The purpose of this chapter is to present the photographic procedure in making a picture.

PART A

The Mechanics of Photography

The most important phase in photography is the mechanics of photography. The photographer must know how the camera works and how to process the film to insure the making of a good picture. Before the photographer attempts to take a picture, the essentials involved in making a picture must be learned.

The Essentials in Making A Picture. There are several things that may be controlled when photographing any subject. The first thing is the camera and how to use it. Each camera is built for a specific purpose. Knowing the size and type of film the camera will accommodate is very important in making a picture. For all pictures there must be light. The making of any picture depends upon the amount of light to

which the film is exposed. Regardless of the type of picture to be taken there must be a subject. The subject image will be recorded on the film thru the medium of the camera.

The Camera. The principle of the camera is very simple and operates in much the same way as does the human eye. The iris of the eye governs the amount of light that enters the eye as the diaphragm governs the amount of light that enters the camera. The lens of the eye is directly behind the iris and focuses the image back to the light-sensitive retina. The lens of a camera does the same in focusing the image back to the light-sensitive film.

The camera is composed of six essentials which makes picture taking possible; (1) a dark box, (2) a lens, (3) a shutter, (4) the film, (5) the diaphragm and (6) a viewfinder.

1. A dark box--The dark box is a light proof box that permits light to enter at a chosen time. The box is built to specifications by the manufacturer.

2. Lenses--Though a simple convex lens will form an image, it has so many optical faults that it is not of much use in photography. The type of lens used in the cheapest cameras are made of special glass and ground according to a special formula. The basic types of lenses in use today are: meniscus, achromatic, rectilinear, anastigmat, apochromat and special lenses known as the wide-angle and the telephoto lens. (16, p. 50)

3. Shutter--The photographic shutter is nothing more than a mechanical light chopper. It is used to let light reach the emulsion of the film for only a small and controlled fraction of time. There are three types of shutters by construction;

(a) the rotary, (b) the between-the-lens, and (c) the focal-plane.

(a). The rotary shutter which is the simplest, consists of a hinged disk with a curved slot pivoted in front of the camera which by means of a spring-wired trigger release is made to cut across the supporting aperture plate.

(b). The between-the-lens shutter is built around the lens and contains the diaphragm as well as the shutter. This type of shutter consists of from three to five blades which are opened and closed at the center. These blades are controlled either by an air brake, as in the compound shutter, or by a meshed chain of gears.

(c) The focal-plane shutter is fitted to the camera near the focal plane of the lens. This type of shutter consists of a durable, light-tight curtain with five rectangular openings or slits, only one of which moves across the film in making the exposure.

4. Film: The film is the light sensitive material placed in the camera upon which a recording of light takes place. The size and type of camera determines the size of the film. Film is made for different purposes in picture taking and it should be used for its specific purpose. Film may be bought in five forms; roll, cartridge, pack, bulk, and cut or sheet film.

5. Diaphragm: The diaphragm controls the amount of light that enters the camera, The diaphragm on the cheaper camera is fixed so that the aperture opening stays the same. With an adjustable diaphragm a better picture may be taken, because the amount of light may be controlled.

6, The Viewfinder: No matter how good the camera may be in other ways, if it is difficult to see the picture in the viewfinder, the camera is inefficient. Make certain that the picture that is seen in the viewfinder is the same picture that is recorded on the negative.

With a working knowledge of the essentials of the camera in mind the types of cameras should be discussed. The choice of camera will depend upon what one can afford to pay, and the type of pictures to be taken. The following will give a brief description as to types and characteristics of cameras.

PART B

Types of Cameras

No one camera will suit all purposes. The universal type of camera has not been made. The important thing to remember about cameras, regardless of the make, is that it is in proper working order and is operated correctly. Cameras differ chiefly in size and shutter speed. Otherwise cameras all work alike. Get the best lens possible, and do not worry about the style of the camera box.

The Simple Box Camera. The box camera is designed to use roll film and is the least expensive of all cameras. There are no adjustments to be made, which makes it simple to operate. This type of camera has a fixed lens, and a fixed shutter speed. With a fixed shutter speed the exposure to light will always be the same whether the subject is light or dark. The lens in the older box cameras is usually set at f/16, and the shutter at 1/25 of a second. The newer types of box camera

has the lens set at f/11 and the shutter speed at 1/50 of a second. With a fixed lens everything beyond a given distance, usually six feet, is in focus.

The Folding Camera. The true folding camera is a masterpiece of camera design. It combines the speed and compactness of a miniature camera with the versatility and smoothness of a box camera. The folding camera is but little more than a box camera that folds up. It uses roll film, and has a variety of interchangeable lenses.

The Reflex Camera. There are two types of reflex cameras by construction; the single, and the double or twin lens. With this type of camera one may see the picture just as it will appear on the negative. This camera may be held at eye level, waist level, or turned upside down over the head. The film used is square so there is no need to turn the camera around to adjust to the shape of the picture.

The Miniature Camera. The miniature, or 35 mm camera is the most popular of all cameras. It is easy to carry, may be used swiftly, gives larger range in focusing, and will take up to 36 exposures before reloading. This camera has a wide variety in interchangeable lenses. The negative produced by this camera is one inch times one and one-half inches in size. This film size presents disadvantages in making enlargements because of the grain in the film.

The View Camera. The view camera is perfect for studio and tripod use. It is ideal for portraits, still life, texture, detail, landscapes, architecture, and interiors. In any type of photography, where action is not a factor, there is no better camera than a view camera.

The Press Camera. The press camera is a rugged folding camera with the speed and compactness of a miniature camera. The press camera is used mostly for sports, street scenes, and portraits. The press camera is fairly expensive to operate because of the film size. It will make a sharp picture and it can be used as a hand camera in almost any field of photography either in color or black and white.

The Polaroid Camera. The big feature in the polaroid camera is its ability to produce a picture in one minute after the shutter has been snapped. The increased speed in the film is the big factor in the success of the polaroid camera.

The Movie Camera. Motion picture cameras differ from still cameras in that they usually do not have more than one shutter speed. This is generally fixed by the design of the camera in the following manner: The camera advances the film at a fixed rate of speed, usually 16 pictures per second. This speed is for silent cameras, but sound cameras advances at the rate of speed of 24 pictures per second. While this movement is taking place, the camera shutter, a revolving disc or barrel behind the lens, is closed to prevent blurring of the image. The open portion of shutters vary in size in different cameras, depending on what part of the time is necessary to complete the film pull-down. Movie cameras have been so simplified that the average person may operate them.

PART C

Accessories

Anything that is used to make a picture more desirable may be classified as an accessory. There are hundreds of

accessories that are available, but the amount of money to be spent on them will govern what is bought. The accessory bought should be made by the same manufacturer as that of the camera being used.

Lenses. There are many types of lenses that may be used with the cameras that have interchangeable lens. If a camera has a fixed lens, then the photographer will be limited to the effort of one lens. The interchangeable lens is a big factor in the popularity of 35 mm cameras. The two most popular lens, other than what the camera comes equipped with, are the wide angle, and the telephoto lens. The normal focal length of a lens is the diagonal of the negative that is being used. Anything shorter than normal focal length is a wide angle lens. The opposite applies to the telephoto lens. Each lens has its advantages and disadvantages. They have been designed for a specific purpose, and to use them for something other than this purpose is not practical. The wide angle lens, increases the field of view, increases the depth of field, but it will also tend to produce distortion in the picture. The telephoto lens, decreases the field of view, decreases the depth of field, but it tends to produce roundness in subjects.

Flash Attachments. Flash photography today is practically a necessity. Without it, it is impossible to make certain kind of action shots. Also it is often the only way to get natural, unposed pictures. Flash photography is ideal for photographing children and animals, whose unpredictable activity makes the problem of shooting them with ordinary

photoflood lamps very difficult. Flashbulbs are used in outdoor photography to fill in shadows even in direct sunlight.

The Tripod. The tripod is used simply to steady the camera for shooting at shutter speeds slower than 1/25 of a second. It can also be used for shooting a series of pictures without changing the position of the camera. The tripod has two adjustments, vertical and horizontal. The tripod is built with telescoping legs which makes it very portable.

Cable Release. The cable release resembles the speedometer cable on an automobile. It is a cable within a cable to permit taking pictures at speeds slower than 1/25 of a second. The cable release is extremely useful in taking portrait pictures.

Filters. The most important thing to remember about a filter is that it is a screen. It is a colored, piece of glass, cellophane or some similar material that may be fitted over the lens of the camera. The purpose of the filter is to permit only the desired light rays to enter the camera. The filter adds absolutely nothing to the picture. Aaron Sussman, in The Photographer's Handbook gives a simple chart regarding filters and their complementary colors.

Red is complementary to Green-Blue
Orange is complementary to Blue-Indigo
Yellow is complementary to Indigo-Violet
Green is complementary to Violet-Orange
Blue is complementary to Yellow-Red (16, p. 221)

Light Meters. Some cameras have an exposure meter built into the camera. This meter simply measures the intensity of light. With each exposure meter there should be a chart which will give proper settings for the camera. Light meters are

built separately for cameras that do not come equipped with one. The light meter is extremely helpful in making good pictures. The risk of over-exposure or underexposure to the film is removed.

After becoming acquainted with the available accessories that may be used to supplement the taking of a picture, the next step that may be taken is the developing of the film. The following material may be used to process the film.

PART D

The Chemistry of Photography

Many people who have become enthusiastic amateur photographers are anxious to extend their hobby to the part of photographic work which is often the most fascinating; that of developing the film and printing their own pictures. This phase of photography is easily-mastered and adds greatly to photographic ability and the fun of taking pictures. To do creditable work in photography, the knowledge of film composition is very important.

Film Graininess. Graininess appears more when a picture is enlarged than when it is of ordinary size. A picture taken with fast film will not show too much grain until it is enlarged and then it becomes porous or hazy. For this reason it is better to use a slower film when a picture is to be enlarged three or four times its contact size.

Film Contrast. Contrast is the degree between tones on the brightness scale. Contrast is greatly dependent upon the way a film is prepared and therefore, film should be purchased

with its particular use in mind. It is known that "ordinary" or blue sensitive film is manufactured to give great contrast; therefore, if map work, diagrams or drawings are to be copied, this type of film would be the best. Lower contrast is desirable in portraits and, therefore, and orthochromatic or panchromatic film should be used.

Film Speed. Speed of the film is determined by the reaction time. The selection of a film in regards to speed depends upon the pictures that are to be taken and under what conditions they are taken. If the picture is to be taken of fast-moving objects such as automobiles or sports scenes it will be necessary to use a fast film. Fast film is also needed on dark, cloudy days because of the absence of light.

Characteristics of Film. The body of the film is usually of two types of material; acetate or nitrate. The body or base of the film is a flexible support which has been coated with a thin layer of gelatin and silver salt. This thin coating is called the emulsion. During the short interval that the shutter is open a definite invisible change takes place wherever light reaches the sensitive coating of the film. To make this change visible, the film is placed in a developing solution which develops or brings out the photographic image by forming a dark deposit of metallic silver wherever the emulsion has been exposed to the light. There are many types of film on the market which will fit whatever purpose may be desired. There are different speeds of film designed for specific purposes. The speed of the film must agree with the lighting conditions and exposure time.

Preparing Film for Development. After a roll of film has been exposed it is ready for development. A totally dark room is essential when loading the film. Load the film on to some holding device which will not let the film touch itself while it is being developed. After placing the film in the developing tank the light may be turned on without damaging the film. The film is now ready for the developer to be added.

Film Developers. All developers have similar properties that control the development process. These properties are:

1. the reducer or hydroquinone
2. the accelerator or sodium carbonate
3. the retarder or potassium bromide
4. the keeper or sodium sulfite

There are several developers that are already made up in powder or liquid form that may be bought. The powders should be dissolved, in distilled water, filtered rain water, or in boiled and filtered tap water. Add enough water to make all the powder dissolve into a fairly thin solution.

Below is a list of firms that produce developers which may be bought in either liquid or powder form.

Eastman's	D-76 (powder)
Ansco's	17 (powder) and Normadol (liquid)*
Edwal's	12 and 20 (powder or liquid)
Harvey's	Panthermic 777 (powder or liquid)*
F-R's	X-33 (powder or liquid)* and X-22**
Eastman's	Microdol (powder or liquid)*
Eastman's	Versatol (concentrated liquid)*
Tetnal's	Neofin (concentrated liquid)*, **
May & Baker's	Promicrol (powder)*
Edwal's	Minicol (powder or liquid)*
Ansco's	Finex-L (liquid)*
Clayton's	P-60 (liquid)*
Ilford's	Microphen (powder)*

* These developers are available in prepared form only. Manufacturers have not made formulas known to public.

** For new thin-layer emulsions such as KB-14, KB-17, Panatomic X, Isopan F, FF. (16, p. 251)

The three reasons for using developers are:

1. Softening and swelling of the gelatin so that the solution can get at the exposed crystals of silver bromide.
2. The dissociation of silver and bromide.
3. The exposed silver bromide crystals are transformed into tangles of extruded silver, commonly called the developed grains.

Hypo. Hypo is the name given to the chemical sodium thiosulphate. Hypo is used to harden and fix the image on both the negative and the positive.

Washing the Film. The film should be washed after it is placed in the developing tank to get rid of air bubbles. This also prevents streaks in the film. The washing will cause the developer to flow more freely over the film. It is also washed after using the developer to stop the action of the developer. The third washing comes after the use of the hypo. After this final washing of the negative it is ready for drying.

Drying the Film. The drying of the negative may be either natural or forced. Hang the negative by a clip by one end with a weight on the other end to hold it straight. If a drying cabinet is not available, a corner or closet may be used to keep the negative away from dust. The ideal method of drying is with a special drying cabinet which is dust free.

Printing. To make a positive from a negative, one must use paper that has been specially sensitized so that it will react to light. The process by which this positive is made is

called printing. Positive prints are made from the film negative so that highlights of the subject will appear white, which will be opposite as that of the negative. Paper which has been given a sensitive coating somewhat slower than that used for films, is placed over the negative and then exposed to light for a few seconds. Wherever light passes through the more transparent parts of the negative and reaches the paper a change takes place in the sensitive coating, while the denser parts of the negative allow comparatively less light to reach and effect the photographic paper. There are two types of printing, contact, and projection.

Contact Printing. With the use of contact printing, the positive will be the same size as the film negative. The most satisfactory contact printing method is by the use of a printing box. This is an oblong box made of wood or metal. Inside the box are one or more bulbs, usually 40 to 60 watts each, as well as a small ruby bulb. The hinged cover is connected with a switch so that when the cover is pressed down, the exposing lamps are turned on and the ruby lamp is turned off, when the cover is raised, the reverse happens. Contact printing is the only method to use if one desires the ultimate in sharpness of detail.

Projection Printing. Projection printing is the most universal of the two types. If the print is to be made larger or smaller than the size of the original negative, projection printing must be used. The printing paper does not come into contact with the negative in projection printing. With the aid of a light bulb and a couple of lenses it is possible to

enlarge a negative to any desired size. The light shines through the lens, through the negative and focuses on the printing paper thus forming an image. After the image has been projected to the printing paper for a few seconds the light is turned off, and the print is developed.

Projection Control. One of the important advantages of projection printing lies in the fact that much may be done to improve the final picture by the use of any of the several treatments popularly referred to as "projection control". Not only can special effects be obtained, but negative defects can be minimized and composition of the picture often improved.

Cropping. Perhaps the most common and useful method of projection control is that of "cropping" or eliminating unnecessary parts of the picture. The important part of the picture, with the view of the subject adjusted for alignment of vertical and horizontal lines and for the most pleasing composition, may be "blown-up" to the size of the final print. Some negatives have several picture possibilities which may be cropped and enlarged separately to give separate pictures.

Diffusion. Still other methods of projection control are available. If the print is to be a portrait or a pictorial scene where critical sharpness is not desirable, some method of diffusion may be used in making the enlargement to provide a pleasing softness of definition in the print. Special diffusion discs made of glass which fit on the enlarger lens may be bought. Satisfactory results can often be produced with a circle of crinkled cellophane or a piece of etched plastic.

Printing Papers. There are two types of photographic papers used for making prints. These types are: printing-out,

and developing-out papers. The printing-out paper is so called because the image appears when it is printed out in the sun and its progress can be seen by lifting up a corner of the print as it rests in one of the split-back printing frames especially made for this purpose.

Developing-out Papers. There are three types of developing-out papers. These are; Chloride, bromide and chlorobromide. Choloride papers are coated with a silver chloride emulsion and are used mostly for making contact prints. Bromide papers are fast and are used mostly for making enlargements. They are about one hundred times as fast as chloride papers. Chlorobromide papers are coated with an emulsion that combines the chloride and bromide salts of silver, and are medium fast and can be used either in contact printing or enlarging. All of these papers are available in two weights, single and double weights.

Printing Chemicals. The printing chemicals like the development chemicals for negatives are basically the same. They each contain; the reducer, the accelerator, the retarder and the keeper. Below is one of many formulas that are available. This formula may be diluted, 1 part stock solution with 2 parts water. Normal developing time is one to one and one-half minutes at 68°F.

Eastman D-72 Universal Developer (16, p. 295)

	Metric		Avoirdupois	
Water (about 125°F.)	500	cc.	16	ounces
Elon (metol)	3.1	grams	45	grains
Sodium Sulphite, dry	45	grams	1½	ounces
Hydroquione	12	grams	175	grains
Sodium Carbonate, dry	67.5	grams	2¼	ounces
Potassium bromide	1.9	grams	27	grains
Water to make	1000	cc	32	ounces

Stop Bath. After completing the development, an agent is needed to stop the chemical action of the developer. This agent is made up of 1½ ounces (48 cc.) of 28 per cent acetic acid (made by diluting 3 parts of glacial acetic in 8 parts water) in 32 ounces (1000 cc.) of water. (16, p. 296)

Hypo. To fix the prints so they will not stain, blister, or mar and yet will last; (1) use an acid fixing bath, (2) use a fresh bath for each new batch of pictures, (3) avoid a bath which has had dyes in it, and (4) add a hardening solution to it. The following is an acid bath that may be mixed by anyone.

Acid Hardening Fixing Bath (F-1)

	Metric		Avoirdupois	
Water, hot	500	cc.	16	ounces
Hypo	240	grams	8	ounces
Water to make	1000	cc.	32	ounces

Dissolve completely, then add 2 ounces (64 cc.) Kodak Liquid Hardener. (16, p. 297)

Washing Prints. The prints may be washed in any one of several ways; (1) by placing them in a tray of water and then constantly turning them over and changing the water at least a dozen times at five minute intervals, (2) by using two trays of water and taking them from one and putting them in the other while the water is being changed, (3) by keeping them moving in a tray in which a stream of water is running, and (4) by washing them for the same length of time in an automatic washer. Temperature should be kept fairly constant during the washing.

Drying Prints. After the prints have been washed, lay them with the picture-side up on a clean blotter, and then remove the excess water by pressing another sheet of blotting

paper down on them. After removing the excess water lay the prints on a cheesecloth stretcher with the picture-side down. There are several types of electric or gas dryers on the market which are very good if it is possible to buy them.

With the chemicals, papers and any other material needed to process the negative in mind it would now be the proper time to discuss the developing and printing areas. The correct use of the darkroom is very important if one expects to produce a picture of good quality.

PART E.

Developing and Printing Areas

The developing and printing is by far the most exciting phase of photography. Having a suitable layout of the film room and printing room is very helpful. It is very important to have these areas comfortable. The arrangement of the supplies and equipment which are to be used should be in an orderly fashion. This is the area in which the photographer will find out whether he has succeeded or failed. This is the unveiling of the masterpiece and the end to suspense.

The Film Room. The only furniture needed in the film room is a shelf on which to load the film onto the developing spool. The shelf should be waist high to facilitate the handling of the film in total darkness. A pair of scissors should be tied to the shelf to keep from misplacing them. The scissors are used to cut the film from the holder or from the protective piece of safepaper. The film room should have a small fan to circulate the air. The space required, for this room, need

not be very large. If there is doubt as to how dark the film room should be this test may be used. Place a sheet of white paper in the room, and if after looking at it for five minutes, it can not be seen, the room is dark enough to load the film onto the developing spool.

Printing Room. Regardless of the size of the printing room, there are two things it must have, these are; electricity and running water. The electricity is used in positioning of safelights over the enlargers and one over the sink. Another important article that uses electricity is the clock with a sweeping second hand. The most important article in the printing room is the enlarger, which uses electricity. Having running water in the printing room is a must. The need for water in processing the film is very important. A large sink is preferable because of the space needed in arranging the developing trays, the stop bath and the hypo. By placing these items in a sink, a drain will be furnished in case of a spilling accident. It is recommended that the hands be kept clean and dry while handling photographic papers in the printing room. When the printing room is not in use, a white light may be turned on which should be located on the ceiling and with a switch so located that it cannot be turned on accidentally.

Ventilation. Ventilating methods depend on the size of the room to be ventilated, the equipment available and the length of time that the room is in use. Larger installations, are best ventilated by means of a central blower system, connecting ducts to the various rooms. In doing photographic

work the ventilating system should be of the positive pressure type, with the blower forcing fresh air into the room, rather than the exhaust type that forces the air out.

Materials, Equipment and Supplies. The amount of materials, equipment and supplies will be determined by what is available and to the amount of work that is going to be done. The thing to remember in handling any chemicals, is that the container must not be attacked by the solution, and that the container will not change the composition of the solution.

The foregoing pages have been written to guide the photographer through the processing of film. This has been an attempt to give reason for doing certain things to film which will help to make a good picture. With a general knowledge of the mechanics, and chemistry of photography, it is now time for the application of the many processes. This will be discussed in the following chapter by the presentation of a suggested teaching outline. This outline will be presented in the form of teacher guide sheets.

CHAPTER IV

SUGGESTED TEACHING OUTLINE

This chapter is composed of teaching guide sheets which are to be used as an aid to the instructor in teaching photography. The guide sheets begin with the history of photography and progress through the different processes used to make a picture. These sheets may be used separately from the rest of the study if desired.

The Guide Sheets. The instructor guide sheets which follow are developed in units of two successive pages each. The several different topics to be discussed in the course are designated on the beginning page under the heading of "Job or Subject". The remaining parts of the guide sheet contains the following headings.

Objectives. Under this heading should be presented the aims and objectives for discussing a particular subject.

I. Introduction or Preparation. This does not refer to what the instructor may do in preparing his own notes and materials for a discussion but what he says or does to prepare the class to be in readiness and eager to receive his instruction.

II. Presentation. In this division are listed the notes from which the instructor will discuss and demonstrate the subject and notes on teaching techniques, aids and devices used.

III. Application. Here a notation is made to be used as a guide to giving practical application of the subject studied. This is an aid to class participation.

IV. Test or Check-up. This phase of the guide sheet may be used as a test or for counseling the student. Each sheet contains four questions that may be given as an aid to reviewing the subject taught.

Tools and Materials. Under tools and materials there will be reference to tools needed with each lesson to be taught. There is nothing listed that would be hard to obtain either by the instructor or the student. The tools and materials are the necessities of any program of photography. Almost every home has a camera of some kind which may be used. It is advisable to start with a camera with simple mechanics to acquaint the student with the working parts of it.

Reference Books. With every guide sheet there is a suggested book to be used as reference. The book used in most part, which could also be used as a textbook, is The Photographer's Handbook, by Aaron Sussman. In this book there is a listing of picture collections which may be used to help the student start a collection, or to be used as comparisons.

Assignments. The final item on the guide sheet is that of assignment. Each sheet has the assignment of the next lesson to be studied. The source of information and the topic to be discussed are mentioned to help prepare the students for the following lessons.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: History of Photography

Objectives: To become acquainted with the beginning of photography.

I. Introduction or preparation: How did photography start? Who were the men responsible for its start?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. What is photography? A. Photography is a means of recording forever the things one sees for a moment. B. Photography is a recording with light.	1. A light-tight box with a mirror, and lens. 2. Daguerreotype picture. 3. Discuss the history of photography.
2. Camera obscura was the forerunner of the modern day camera. What did it do?	
3. Joseph Nicephore Niepce was the first man to fix an image.	
4. Louis Jacques Mande Daguerre worked with Niepce to speed up the process. Niepce died in 1833, leaving Daguerre to experiment alone. Daguerre used mercury to speed up development in 1838.	
5. William Henry Fox Talbot in 1839 perfected a way of printing pictures on white paper coated with silver chloride.	
6. Sir John Herschel introduced to the world the words photograph and photography.	
7. Edwin H. Land introduced in 1947 the first polaroid camera.	

III. Application: Compare daguerreotype pictures with the pictures of today.

IV. Test or Check-up:

1. What is photography?
2. Who was the first man to fix an image?
3. When did photography get its start?
4. Who is credited with starting photography?

Tools and Materials: Samples of daguerreotype pictures, and modern day pictures.

Reference: History of Photography, Eder, Josef Maria
The History of Photography, Newhall, Beaumont

Assignment: Read chapter 3 in The Photographer's Handbook, by Aaron Sussman.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: The lens and its function

Objectives: To become familiar with lenses and their use.

I. Introduction or preparation: What is a lens? Will any piece of glass suffice as a lens?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. The most perfect lens is the eye. 2. The first lens was used in 1568 by Daniella Barbaro. A. The first lens was a spectacle. B. The lens was convex. 3. Basic types of lens used today; A. Meniscus-one piece of glass. B. Achromatic-single lens made up or two or more pieces of glass. C. Rectilinear-two achromatic lens. D. Anastigmat-two or more lens cemented together. E. Wide-angle-broader angle of view. F. Telephoto-distant objects seem nearer. 4. Focal length of a lens is the distance between the lens and the film plane. A. Focal length is determined by the manufacturer. 5. Focus of a lens; A. Let rays of the sun pass through lens and fall on a sheet of cardboard. B. Move the cardboard nearer or farther away to make image sharp then measure distance.	1. Have samples of ordinary glass. 2. Spectacle lens may be used to explain grinding formulas. 3. Variety of camera lenses. 4. Teach students to focus the image by using a lens.

6. Lens coating is done to decrease reflection losses.

7. Care of lens;
   A. Always keep lens covered when it is not in use.
   B. Never take it apart to clean it yourself.
   C. Do not expose the lens to the sun for long periods of time.
   D. Avoid keeping it in damp or warm places.
   E. Do not subject it to extreme changes in temperature.
   F. Do not put fingers on its surface.
   G. Do not drop or jar it.
   H. Never use solvents to clean it.

III. Application: Use the lens to focus the rays of sunlight on a cardboard to get correct distance to make the image sharp.

Determine whether a lens is concave or convex.

IV. Test or Check-up:

1. When was first lens used?
2. How is focal length determined?
3. Why are lens coated?
4. Give five ways for care of the lens?

Tools and Materials: A collection of lenses that may be handled.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Chapter four in The Photographer's Handbook, on the subject of "f" stops.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: F stops and their uses.

Objectives: To learn how to set f stops to get proper exposure.

I. Introduction or presentation: What is an f stop? Why is the f stop so important? Do all cameras have f stops?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. An f stop is simply a device to limit the amount of light that enters the camera.	1. A large model of a camera to show setting of f stops.
2. There are three types of stops; A. The fixed stop-a hole smaller than the lens aperture, punched out of a piece of black metal. B. The sliding stop-a thin strip of black metal which slides, in grooves, across the front of the lens. C. The iris diaphragm-is a variable stop. It is made up of curved leaves of sheet metal overlapping each other like the leaves of a fan.	2. Set f stop and let each student see the amount of light that enters the camera. 3. Types of cameras with different f stops. 4. Box camera that has a fixed f stop.
3. What a stop does; A. Makes the picture sharper B. Equalizes illumination C. Depth of field D. Controls the exposure	
4. How stops are marked; A. F means factor or fraction B. F also means speed of lens C. The number after the letter indicates the relation between aperture of the stop and the focal length of the lens.	
5. System of lens marking; A. Each numerical stop lets through twice as much light as the next stop higher.	

B. The higher the number the smaller the hole.
C. The chief sizes of stops are used internationally:
f 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45, 64.

6. What "lens speed" means; the term speed of a lens refers to the largest opening or stop at which it can be used.

III. Application: Experiment with camera to learn how to set f stops.

IV. Test or Check-up:

1. What is an f stop?
2. Name three types of f stops?
3. How are stops marked?
4. What is lens speed?

Tools and Materials: Box camera and a camera with an adjustable diaphragm.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Read chapter five in The Photographer's Handbook on the use of the shutter.

INSTRUCTOR'S GUIDE SHEET

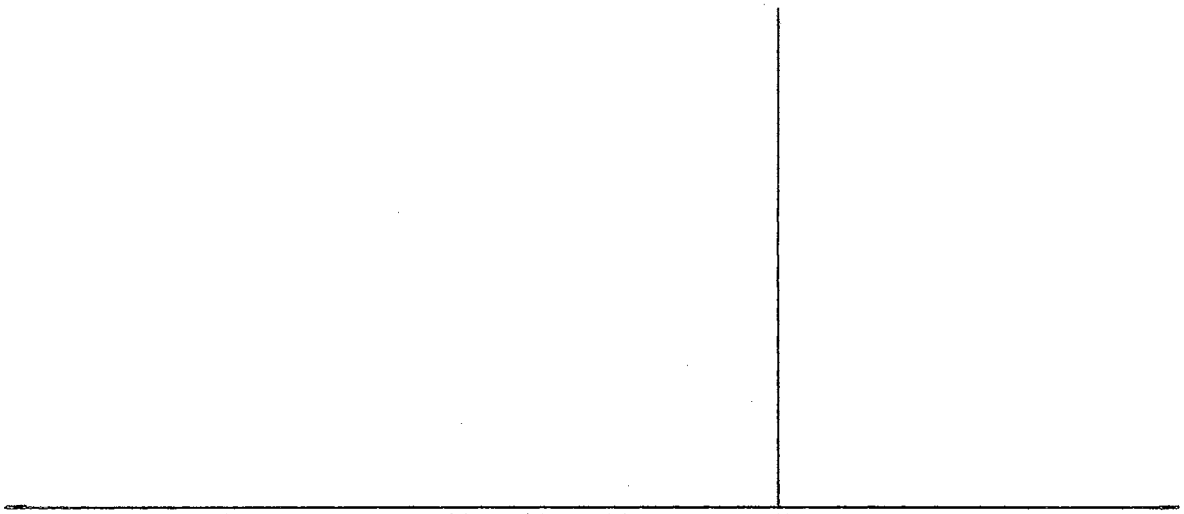
Job or Subject: The shutter

Objectives: To teach students how to use shutter.

I. Introduction or preparation: Why use a shutter? Does it improve the picture?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. The shutter is nothing more than a mechanical light chopper. 2. It lets the light reach the emulsion on the film for a controlled length of time. 3. Three types of modern shutters: A. The rotary shutter-a hinged disk with a curved slot pivoted in front of the camera. B. The iris shutter-composed of three to five blades which are opened and closed at the center. C. The focal-plane shutter--contains a light-tight curtain with five openings or slits, only one of which moves across the film to make the exposure. 4. Operating the shutter: A. Open the camera or remove the back so the shutter may be seen. B. Set the shutter at any speed and trip it to estimate time. C. Set the shutter on bulb and trip it. D. Set the shutter on time and trip it. 5. Taking care of the shutter: A. Never leave a shutter tensed. B. Be careful when setting it for bulb and time. C. Do not attempt to clean or oil a shutter of any kind.	1. A large mock-up of a camera to show the shutter. 2. Set the shutter at different speeds to get estimate of time. 3. Cameras with different types of shutters.



III. Application: Experiment with the shutter with the camera empty. Estimate time by using the shutter.

IV. Test or Check-up:

1. What is a shutter?
2. Name three types of shutters?
3. What is the function of the shutter?
4. Is it advisable to oil the shutter?

Tools and Materials: Reflex or folding camera.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Bring simple box cameras to class.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: The simple box camera.

Objectives: Learn to operate the box camera.

I. Introduction or preparation: The camera works on the same principle as the human eye. How does the eye work?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. The eye works much faster than the camera, but the same process takes place. 2. Location of shutter release; A. The shutter release is usually on top of the camera. B. The shutter on the box camera is set at a speed of 1/50th of a second. 3. F stop-the f stop is set by the manufacturer usually at f/11. 4. Focus-the box camera is focused on everything beyond a distance of six feet. 5. Load the film in the camera with the use of a roll of film that is not any good. 6. Expose and wind the film. 7. Unload the camera.	1. A film strip may be used to show the proper way of using the camera. 2. A roll of exposed film to practice with. 3. A box camera. 4. Teach the student how to hold the camera to take picture.

III. Application: Practice loading the camera and triping the shutter. Wind after each exposure.

IV. Test or Check-up:

1. What speed is the shutter set at?
2. What is the f stop setting?
3. How is the camera focused?
4. Is it possible to take a double exposure with a box camera?

Tools and Materials: A simple box camera.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Read material on camera film in The Photographer's Handbook, chapter eight.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Camera film.

Objectives: To become familiar with types of film available.

I. Introduction or preparation: Film is the sensitive material that is needed to record the image on. What is film made from?

Teaching Outline	Teaching Techniques, Aids and Devices
1. Composition of film: A. Emulsion-gelatin coating with silver salts. B. Base-cellulose acetate. C. Anti-halation-stops halo. 2. Basic exposure for a given film assumes that the outside light is bright sun and the subject is average. 3. ASA-American Standards Association is the speed rating of film. The higher the number the faster the film. 4. Factors affecting exposure: A. The shutter B. The color of the light C. The temperature D. Focal length E. Developer F. Subject contrast G. Kind of subject H. Kind of film used 5. The grain in the film is determined by the speed of the film. 6. Forms of film: A. Roll B. Cartridge (35mm) C. Pack D. Cut or sheet E. Bulk	1. Have both exposed and unexposed film to show what happens. 2. Have samples of all types of film. 3. Show why flexible film is used.

7. Film types:
   A. Panatomic X, ASA rating-25/20
   B. Isopan, ASA rating-50/32
   C. Supreme, ASA rating-50/32
   D. Superior, ASA rating-50/32
   E. Plux X, ASA rating-80/64
   F. Verichrome pan, ASA rating-80/64
   G. Tri-X, ASA rating-200/160

8. Choose one film and stay with it until you have learned what it will do.

III. Application: Let the student examine the film to see what each part is like.

IV. Test or Check-up:

1. What is the composition of film?
2. What does ASA mean?
3. Name five forms of film.
4. How is the exposure controlled?

Tools and Materials: Different forms of film.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Read chapter twelve, in The Photographer's Handbook on filters.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Filters

Objectives: To learn about filters and how to use them.

I. Introduction or preparation: Does a filter help the picture? When is the filter used?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. A filter sifts light rays by serving as a screen. 2. Complementary-the color of the light absorbed by any object is complementary to the color reflected or transmitted by it. 3. Colors that are complementary to each other: A. Red is complementary to green-blue B. Orange is complementary to blue-indigo C. Yellow is complementary to indigo-violet D. Green is complementary to violet-orange E. Blue is complementary to yellow-red 4. There are four types of filters: A. Sheets of plain gelatin film. B. Sheets of film cemented between glass flats. C. Dyed-in-the-mass glass. D. Transparent plastics. 5. Using a filter: A. Do not use a yellow filter under artificial light because the yellow light is its own filter. B. A filter will not darken a sky that is misty or overcast. C. Overexposure will cancel out the effect of the filter.	1. Pieces of colored glass. 2. Piece of cellophane. 3. Filter mounts. 4. Pictures made with filters.

D. White light is made up of three colors; red, green, and blue. A filter of either color will absorb the light of the other two. E. Flat lighting needs a strong filter like red or orange. 6. Filter mounts: A. Screw in-screws into the camera. B. Bayonet-slides into the camera. The filter mount enables the filter to attach firmly to the lens and to lie parallel to the image or lens plane.	

III. Application: Use a filter to take pictures under different lighting conditions. Compare with pictures that did not use a filter.

IV. Test or Check-up:

1. What does a filter do?
2. What color is complementary to red?
3. Name four types of filters.
4. Name two filter mounts used.

Tools and Materials: A camera and a variety of colored filters.

Reference: The Photographer's Handbook, Aaron Sussman.

Assignment: Read chapter fourteen in The Photographer's Handbook on developing of film.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Developing

Objectives: To learn the proper process in developing film.

I. Introduction or preparation: How is the image brought out on the film.

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
Steps used in developing film.	
1. Load the film on the developing spool.	1. Developing spools.
2. Place film in tank and fill with water to wet the film.	2. Developing tanks.
3. Pour water out after two minutes.	3. Thermometer to check developer.
4. Make sure the developer is at a temperature of 68° then pour into tank.	4. Graduated beakers.
5. Agitate the tank gently at intervals of 30 seconds.	5. A timing device.
6. At the end of development time pour out the developer.	6. Rolls of film that are no good.
7. Pour in the short stop and agitate thoroughly to stop action of the developer.	7. Give practice in rolling of film onto the developing spool.
8. At the end of three minutes pour out the short stop.	
9. Pour in the hypo solution to fix the image on the film.	
10. At the end of the required time pour out the hypo.	
11. Remove the cover of the tank and fill it with water and wash it by placing the spool under a stream of water for fifteen to twenty minutes.	
12. Remove the film and dip it in a solution of photoflo for about 30 seconds to keep film from scratching.	
13. Hang film up to dry with a film clip on each end.	

A good negative will have a considerable amount of detail, even in its very darkest and lightest portions, unless those portions represent parts of the picture which were entirely lacking in detail.

A good negative should be transparent enough, even in its very blackest areas, so a newspaper can be read through it. A negative has the light and dark areas reversed.

III. Application: Practice rolling film on the developing spool. This may be done in the light with film that is no good.

IV. Test or Check-up:

1. What is the temperature of the developer?
2. What is the short stop bath?
3. What is a negative?
4. Why agitate the developing tank?

Tools and Materials: Developing spools, developing tanks, and film that has been exposed.

Reference: The Photographer's Handbook, Aaron Sussman, and Developing Printing and Enlarging, by Eastman Kodak Company.

Assignment: Chapter fifteen in The Photographer's Handbook on printing and enlarging.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Printing and Enlarging

Objectives: To familiarize students with the processing of the film.

I. Introduction or preparation: How is a positive made from a negative?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. There are two types of printing: A. Contact printing-the positive is the same size as the negative. B. Enlarging-the positive may be larger or smaller than the negative.	1. Different types of pictures which will demonstrate contact and enlarging. 2. Printing frame. 3. Enlarger. 4. Use both types of printing to demonstrate.
2. Using a printing frame for contacts. A. Put the negative in the printing frame and the paper in contact with it and expose it to light. B. Length of exposure is determined by kind of paper the density of the negative, intensity of the light and distance the frame is held from the light.	
3. Use contact printing to get sharpness of detail in the picture.	
4. Enlarging or projection printing. A. Print may be made larger of smaller. B. Projection printing is not as sharp in detail as contact prints.	
5. Qualifications of a good enlarger. A. Focusing adjustments that are precise and easy to use. B. A tall rigid support for big prints. C. A simple method for changing lenses.	

D. A negative carrier. E. Heat control that does not leak light. F. Balance or control for raising and lowering the enlarger. G. A heavy baseboard. H. Well-insulated electrical units. I. Filters that may be used while composing the picture.	
6. After the negative has been exposed to the sensitive material on the printing paper, the paper is developed.	
7. Develop required time and use stop bath.	
8. Put in hypo to harden the image.	
9. Wash prints thoroughly in clean water.	
10. Dry prints by using natural or forced drying units.	

III. Application: Process a negative to make a positive both through contact printing and enlarging.

IV. Test or Check-up:

1. What are two types of printing?
2. What is the advantage in enlarging printing?
3. Which process produces the sharpest detail in the print?
4. How is the length of exposure determined?

Tools and Materials: A printing frame and an enlarger to demonstrate the qualities of each. Different types of paper to show contrast in detail.

Reference: The Photographer's Handbook, Aaron Sussman

Assignment: What causes negative and positive defects? Read chapter eithteen in The Photographer's Handbook.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Defects in negatives

Objective: To learn what causes defects and what to do about them.

I. Introduction or Preparation: Is the negative suitable for using to print pictures?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. Negative is thin and lacks detail; A. Underexposure B. Use a larger lens opening in the future or slower shutter speed.	1. Film that is thin. 2. Film that is dense. 3. Film that is streaked. 4. Any film that is not satisfactory. 5. Show the film and give reasons for its defect.
2. Negative is dense; A. Overexposure B. Use small lens openings and faster shutter speeds.	
3. Negative shows detail but is thin; A. Underdevelopment B. Use correct temperature for developer and correct procedure.	
4. Negative is dense and blocked-up in the highlights; A. Overdevelopment B. Decrease development time	
5. Negative is flat; A. Improper developer or too warm B. Use proper developer	
6. Negatives are milky; A. Improper fixation B. Replace negative in fixer	
7. Negatives show faint red or blue color; A. Anti-halo coloring is removed B. Place negatives in solution of 5 per cent sodium sulfite for five minutes then wash and dry.	

8. Negative shows stains or streaks; A. Insufficient agitation and the film was not rinsed properly. B. In future agitate film while using the developer and be sure to use short stop bath. 9. Negative has small round spots that are clear and show less density than the rest of the negative. A. Bubbles of air have clung to film while developing. B. Wet film thoroughly before the developer is put in.	

III. Application: Take film with defects and try to improve its contrast through the corresponding cause.

IV. Test or Check-up:

1. What causes a negative to be thin?
2. What can be done about it?
3. What causes a negative to be dense?
4. What is done when anti-halo is gone?

Tools and Materials: Defective film and proper chemicals to improve it if possible.

Reference: Developing and Printing, Ansco

Assignment: Defects in positives and what causes them. Read chapter eighteen in The Photographer's Handbook.

INSTRUCTOR'S GUIDE SHEET

Job or Subject: Defects in prints

Objectives: To learn what causes defects in prints and how to correct these causes.

I. Introduction or preparation: Is a defective print caused by the enlarger, the chemicals, or you?

II. Presentation:

Teaching Outline	Teaching Techniques, Aids and Devices
1. Print is too dark; A. Overexposure B. Make a new print with less exposure.	1. Show prints that have defects. 2. Have some worn out chemicals to show. 3. Show paper that is fogged.
2. Print is too light; A. Underexposure B. Make a new print with more exposure.	
3. Print is flat and lacks brillance; A. Removed from the developer too soon. B. Use correct development time.	
4. Print is contrasty with shadows and highlights lacking in detail; A. Incorrect contrast grad of paper B. Use softer grade of paper, and longer exposure	
5. Yellow or brown stains; A. Insufficient agitation in fixing bath, or incomplete washing. B. Agitate prints when in fixing bath and wash thoroughly.	
6. White spots; A. Air bubbles on print or dirt on negative and paper. B. Keep negative and paper clean.	
7. Black spots; A. Dirt in solutions or undissolved chemicals. B. Use proper chemicals and keep the containers clean.	

8. Prints are gray and the borders are not clean and white; A. Paper has been exposed to the light, improper developer or development too long. B. Keep paper in package and use correct developing time.	
9. Blistering of the print; A. Wash water too warm or prolonged soaking in wash water. B. Use water with proper temperature and proper washing time.	

III. Application: By using defective prints try to correct mistake by making new ones.

IV. Test or Check-up:

1. What is wrong when print is too dark?
2. What causes print to be too light?
3. What causes white spots on prints?
4. What causes prints to have black spots?

Tools and Materials: An enlarger and clean chemicals to improve a defective print.

Reference: Developing and Printing, Ansco

Assignment: Review previous assignments.

The application of photography must begin with the ability of the individual to recognize a subject that will make a good picture. Taking the picture is just a small part in the application of photography. There are some very important things to remember in improving the picture.

Improving The Picture. One of the best ways of improving pictures is to look over others that have been taken. When looking at each picture try to visualize where the photographer stood, where the light came from, how the picture would have changed if either the camera position or light angle had been altered. By being conscious of these changes, a definite improvement will take place.

Almost anything which draws a persons attention has the makings of a picture. It may be the representation of a person, a place, or an object. Whether it is a good picture or a bad one depends on how it is taken. No picture should have more than one subject. With several objects in a picture it may become hard to distinguish the subject from the distractions.

This chapter was written primarily, to be used by the instructor as an aid or outline, in teaching photography. The guide sheets may be used exclusive of the rest of the study. The following chapter is composed of the conclusion and recommendations for further study in the field of photography.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The industrial arts program has progressed a great deal since it was first introduced into the public school systems. It was first known as manual training, because of the absence of machines; the training was very much physical. As new types of industry developed there came about a new term that of "industrial arts", which serves as an exploratory program, and is the connecting link between industry and the school.

The teaching of photography as an industrial arts subject has progresses in leaps and bounds in the last few years. Photography itself is fairly new in comparison with the use of tools, and the age of civilization. Photography is the best possible means of communication in the world; being understood by all people, of all language, and all time.

Conclusion. Photography is an art that is well received by everyone. It is a product that may be developed to provide a way of earning a living, or merely to serve as entertainment for the individual. By stimulating a creative interest in the individual to obtain a more rounded education, through the teaching of photography, the student may carry this resourceful way of learning into other fields of education. Installing confidence in the individual is very helpful in training him

to strive for perfection. The development of the student emotionally as well as physically will help to determine his success in life.

Recommendation. There are two very important items that should be discussed for further study. The use of color photography, and the darkroom. Color photography is very popular today therefore a study should be made of it to aid in the taking of the picture. As of now there are no facilities in the average school to process color film.

A study of the dark-room should be made regarding the size, the location, and the equipment to be used in it. The space available is one of the most important factors to consider when setting up a darkroom. The amount and quality of equipment is also very important in the success of the darkroom.

Recommended Magazines. There are many photography magazines that may be bought today. The main function of these publications are to present before the people new equipment and their proper use. Some of these magazines are; Popular Photography, Ziff Davis Publishing Co., 1959, Modern Photography, Photography Publishing Co., 1959, U. S. Camera, U. S. Camera Publishing Corp., 1959, Camera 35, U. S. Camera Publishing Corp., 1959. These magazines are published periodically and are recommended to improve picture taking.

In The Photographer's Handbook, Aaron Sussman lists several magazines that are published in other countries, other than the United States, which are popular with photographers throughout the world.

Recommended Textbook. Considering the use of a text and the way this writer would teach the course, The Photographer's Handbook by Aaron Sussman, would be the definite choice. The book is well organized and written for the amateur photographer. The book was revised in 1958 to keep in step with the new methods of development in the field of photography.

In the bibliography of this study may be found a selection of books that have been used in compiling this report. These books are available in most public and school libraries and may be checked out. Many of these could be used as a textbook, but their value is greater as reference material.

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