THE DEVELOPMENT OF PHOTOGRAPHY AND PHOTOGRAPHY IN THE HIGH SCHOOLS OF OKLAHOMA

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CHAPTER I

INTRODUCTION TO THE SURVEY

One hundred and fifteen years ago the world was given a new process for pictorial reproduction. The process was known as "heliography" and rightly belongs to the field of lithography. (3, page 193) This was the discovery that was to lead to the founding of photography. Today, photography is an art, a science, and a profession upon which many thousands of Americans depend for their livelihood. The use of photography is unlimited. New discoveries are increasing the uses daily. The education world was quick to see the potential of photography as an aid to instruction. Today, there are few schools in America that do not use filmstrips or motion pictures to supplement the educational program. Textbooks are more valuable as the illustration possibilities are unlimited through the use of photography. The 1950 census showed that 52,489 persons were engaged as professional photographers. This figure does not include the thousands of persons employed in the manufacture and distribution of photographic materials.

The people engaged in photography are educated in the public schools. The schools make use of photography in many ways. Therefore, photography courses should be utilized as a means of general education in the schools. The industrial arts program acquaints the students with industrial processes, affords an opportunity to develop skills, and furnishes a source of practical application of academic knowledge. The graphic arts, as a

division of industrial arts, can find an ally in photography. Mechanical drawing, printing, and photography could be combined to form the graphic arts division. In this capacity, photography would not be limited to a few but could serve all students as well as the school. The photography class also could be used to provide a wider experience in the fields of science, journalism, and art. An activity need could be filled by photography through the formation of camera clubs. Photography as a school subject is not new. One Oklahoma teacher remarked that photography, in some form, has been part of that school's curriculum since the early 1920's. Photography first appeared in the Oklahoma schools as an independent subject in 1945. The ten-year period to the present date has seen photography courses offered in twenty-two Oklahoma schools. Seventeen Oklahoma schools are now offering photography. Photography potentials are often recognized but the possibilities are not explored. Photography must be sold to the administrators and its value to the school and to general education must be proved. It is hoped that this study may help, in some manner, to establish photography as part of the general education program in Oklahoma schools.

Origin of the Study. Every teacher has probably questioned the value of his teaching. How were other teachers presenting the material? What equipment and methods are being used? How are common problems solved? Such questions no doubt have been asked by many teachers. With an established subject, such as reading, mathematics, or science, many publications are available that discuss freely the various methods of presenting a course and present sufficient data to form conclusions as to the results.

The new teacher in an established field of education can readily find discussions of problems unique to his work. The teacher of a new course in photography does not have the advantage of such extensive information.

The author was faced with this problem. The first few semesters required orientation of material and methods. No time could be spent pondering the value of the teaching. Once the course was established, defects in the program became apparent. It was thought that education reference books and current educational publications would discuss methods of teaching photography. A search failed to locate any materials devoted to the teaching of photography. Many brief references were found as to the uses of photography in education but no material was found discussing the problems of teaching photography. The desired materials were not available in reference books.

The materials found in reference books are the results of teaching experience. Experienced teachers could supply the needed information. This could have been the source of information that would aid in establishing a better course in photography. Inquiries were made to locate the schools teaching photography. The results showed that photography was not offered. There were no experienced photography teachers. This source of information also was not available.

Photography, a science so important to industry and education, had not yet been established as a means of increasing the value of general education. This situation became a personal interest of the author. The origin of this survey developed from this personal interest. The published data is still limited, but experienced teachers are now available as a source of data. This study does not propose to introduce a new phase

of education. The aim is to secure data concerning the photography teacher and the photography class that can be of value to those teachers now engaged in teaching photography and to the schools that might desire to offer a class in photography.

Use of This Study. To say this is the first time a survey was made concerning photography in the high schools would be a doubtful statement. It could be assumed that many teachers and administrators have had need for such information. The author has located only one published discussion devoted to teaching photography. References were found of a textbook nature that discussed materials and processes but did not discuss methods of teaching or the problems involved in teaching photography. There are probably written accounts that have been published that were not located. The new teacher of photography may find the answer to his problems in this survey. As the value of photography in the schools is recognized, there will be a demand for data by the school administrators. It is possible that manufacturers of photographic equipment and materials could use such information in designing products for greater use in the school photography classes. If no other use is made of this survey, the experience and knowledge acquired by the author have made the effort worthwhile.

How the Data Was Obtained. The schools offering photography were located by information found in the Annual High School Bulletin, published by the State Department of Education, by examining the Application for Accreditation filed by the high school principal at the State Department of Education office, and by questioning teachers and students enrolled at Oklahoma Agricultural and Mechanical College. A search was made for

published literature that dealt with the problems of teaching photography. A questionnaire was prepared and sent to the high school principals. The data from the returned questionnaires were tabulated and evaluated. A visitation program was planned to enable the obtaining of valid data. The questionnaire served as a guide for the discussion when the visits were made. Some material was obtained from manufacturers of photographic materials. The author was fortunate in having the opportunity to discuss this survey with Adrian L. TerLouw, Educational Consultant of the Eastman Kodak Company's Sales Service Division. The account of his experiences in the field of education was of great value in evaluation of the data. The history of photography was outlined from all available books and current publications. Dr. Haskell Pruett, Head of the Department of Photography at Oklahoma Agricultural and Mechanical College, made his personal collection of photography books available. Dr. Pruett's collection of photography books and magazines is one of the largest known personally owned libraries of photographic literature. The history and philosophy of industrial arts was developed from current history books, textbooks, and publications devoted to industrial arts.

Definitions of Significant Terms. The following terms are used frequently in this survey. The sense in which these terms are used is given to facilitate understanding of the data.

Education:

> The proper education of today is the preparation for the duties and responsibilities of life. (Woodward) (28)

Education, as used in this study, means the total learning process experienced by the student through his school life.

General Education:

> The purpose of a general education is to provide rich and meaningful experiences in the basic aspects of living, so directed as to promote to the fullest possible realization of personal potentialities, and the most effective participation in a democratic society. (Science Report of the P.E.A.) (28)

General education are those aspects of school experiences directed toward acquiring general knowledge rather than specific knowledge.

Vocational Education:

> Vocational Education is a generic term whose scope embraces all kinds of vocationally purposeful education such as industrial, homemaking, agriculture, commercial, mining, and so on. (5, page 7)

Industrial Arts:

> Industrial arts, as a school subject, may be defined as a study of machines, tools and processes by means of which the forces of nature are utilized and the raw materials of nature are changed by man to make them more valuable and pleasing. It leads to an understanding of the native qualities of raw materials and of the natural forces together with a knowledge of the methods and practices of utilizing and changing these materials and forces. It is also concerned with the social and economic problems incident to these changes. (Oklahoma Advisory Committee) (28)

> Industrial arts is the name applied to all forms of shopwork and industrial drawing taught in elementary, junior high schools, high schools, and possibly in colleges when the chief purpose is general education and not specifically vocational in nature. This term was evolved during the early part of the Twentieth Century and is almost universally used today to refer to non-vocational shopwork and industrial courses in the public schools. (DeWitt Hunt) (28)

Graphic Arts:

The graphic arts is that division of industrial arts devoted to the study of such fields as printing, mechanical drawing, silk screen printing, and photography.

Photography:

> Photography is the art of obtaining the representation of objects by the agency of light upon sensitive substances. (18)

Contact Printers:

The contact printer is a box with a glass top containing a light source that is used to expose sensitized material through a negative. The name is derived from the fact that the negative is in contact with the paper during the exposure period. A print the same size as the negative is obtained.

Enlargers:

The enlarger is a device by which the negative image can be projected to form a positive print of any desired size. This was originally called a "projection printer".

Print Dryer:

Dryers are a variety of devises using gas or electricity as a source of heat to make the drying of prints more rapid.

Ferrotype Plates:

A highly polished metal plate used to make a smooth glossy surface on certain types of photographic paper is called a ferrotype plate.

Chemicals:

This means the various solutions used in the photographic developing processes.

Equipment:

Equipment means the camera, enlarger, contact printer, lights, and all other materials, with the exception of film, paper, and chemicals, needed to make photographs.

Supplies:

Supplies refers to the photographic paper and film needed to make pictures.

Darkroom:

Darkroom is the name given to the room in which the printing and developing processes are carried out. The name indicates that this room can be darkened.

Printing Room:

The printing room is designed primarily for the process of photographic printing.

Developing or Film Room:

The developing room is designed to accommodate the equipment and materials needed to process film.

Loading Room:

The loading room is a small room which can be darkened and is used only for the handling of film during loading or unloading operations.

Light Trap:

A light trap is a series of partitions arranged to form a passageway which will exclude light. It is used to eliminate the necessity for a

series of doors and to aid ventilation.

Available Literature. There is no known literature available on the particular interests of this survey. The State Department of Education can supply the names of schools offering photography. The Complete Photographer, an encyclopedic reference, devotes one section to the teaching of photography. Eastman Kodak Company has some materials on teaching photography that are available on request. Current photographic and educational literature are suggested sources.

Possible Use of the Results of This Investigation. It is hoped that this survey will prove of value in the establishing of a greater number of photography courses in the Oklahoma high schools. The establishing of more photography courses will create a demand for qualified teachers. Teacher training institutions of Oklahoma would then have the opportunity of increasing their offerings by initiating new courses of study directed to the preparation of photography teachers. If such a program develops, there would be sufficient cause to establish a certification policy. The issuing of a teaching certificate for photography would elevate the position of the photography teacher. Photography would receive recognition as a part of the education program. Photography programs could be standardized in content. Vocational education in photography could be offered to a large number of students.

Each photography teacher represented in this survey will receive a copy of the study. This will offer an opportunity to compare their methods and facilities with those of other schools. Possible improvements and new applications could result from this comparison.

The administrator who is interested in offering a course in photography could use this data in formulating plans for facilities and estimating the cost of equipment. The discussion of uses of photography might disclose possible applications of photography that were not in the administrator's plans.

How the Data Are Reported. The material obtained from the questionnaires and the visitations has been prepared in table form. A discussion section dealing with each topic presents the conditions found in the school and the interpretation of results due to this condition. The report of the survey is found in Chapter IV. A summary of the study, with the author's recommendations for the improvement of certain conditions and suggestions for establishing new courses in photography is found in Chapter V.

For the benefit of those who may read this survey and who are not well acquainted with photography, Chapter II has been prepared to give a brief history of the discovery of photography to show how it has developed to the present time, and tells of the contributions of Americans who had a part in establishing the science of photography. It will be seen that photography has evolved through the fields of art, physics, and chemistry.

The basis for the author's belief that photography should be a part of the industrial arts program is presented in Chapter III. A brief history of the philosophy of industrial arts is presented as a foundation for the present-day objectives. How photography can help to fill these objectives is discussed.

CHAPTER II

A BRIEF HISTORY OF PHOTOGRAPHY

A complete history of the discoveries and inventions leading to the founding of photography would require extensive research. In order to present the more important events in the history of photography, this chapter has been divided into two parts. Part A is a brief report of the major discoveries in Europe up to 1890. Part B reports information on American contributions to the present date.

Part A

Events Leading to the Establishing of Photography

Man's desire to learn has made his sense of vision invaluable. The visual concept relates the whole story of action, shape, and size. From the earliest days of history men strived to reproduce visual examples of their life, art, and surroundings. Crude drawings, clay figures, carvings, and detailed drawings have left evidence that gives one a visual record of early life. It was this desire to reproduce visual concepts that led to the discovery of photography.

Section 1

Early History

The first use of the work "photography" is generally accredited to Sir John Herschel, an English astronomer. "Photography", from the Greek, means to "draw with light". It may further be defined as the science of

obtaining an image by the action of light on a sensitized substance. (10, page 1). Herschel first used the word "photography" in a report to the Royal Society of London given March 14, 1839. (3, page 258) However, proof has been found that a Berlin astronomer, Johann von Maedler, used the word "photography" in an article about Talbot's inventions (3, page 258) that was published February 25, 1839.

Events Leading to the Discovery of the Camera Obscura. The real beginning of photography dates from the days of Aristotle. The exact date of the discovery that light passing through a small opening would form images is unknown. The first reliable recorded information relating to this phenomena of light is found in the "Problemata" published by Aristotle in 350 B.C. (10, page 1)

The Camera Obscura. The camera obscura was the first application of forming an image by the action of light through a small opening. "Camera obscura" is Latin; "camera" meaning "room" and "obscura" meaning "dark", thus dark room. The date of the discovery of the camera obscura is unknown, but references have been found in the works of Leonardo da Vinci dated before 1519; Papnutio, before 1521; Reinhold in 1540; and in the writings of others from 1550 to 1585. (14, page 14) The most publicized account of the camera obscura was found in the "Magia Naturalis" of Jean Baptist Porta which appeared in Naples in 1553. (10, page 1) The popularity of his "Magia Naturalis" led to the false conclusion that he was the inventor of the camera obscura.

The camera obscura, in its earliest form, consisted of a darkened room, that light could enter only through a small opening in the wall.

The light rays passed through a prism and were projected onto a table in the center of the room. The early artist could then trace the patterns and colors of nature.

Early attempts to make portable camera obscuras were generally confined to tents or boxes that in reality were only small rooms that could be carried from place to place. Light rays entered through a small opening in the side of the tent or box and by the use of prisms and mirrors the image was focused upon a sheet of white paper. The artist could then trace the objects. The early experimenters soon had a desire to sharpen the image and to change the size or proportion of the image. Prisms and mirrors were used at first with considerable improvement in the image sharpness.

First Use of the Lens. Jerome Cardan, in 1550, describes what seems to have been the first use of a lens in the camera obscura. (14, page 14) Daniel Barbo, a Venetian nobleman, is credited with the first description, in 1568, of the use of a biconvex lens in the camera obscura to sharpen and improve the image. (3, page 42) The addition of a lens brought about many changes in design and use of the camera obscura.

Astronomers as well as artists soon became interested in the camera obscura as a means to study sun spots and eclipses. (14, page 26) Lens mounted in long tubes were used to form images of the sun on white paper by Jesuit Scheiner in 1612 as a means to study sun spots. (14, page 26) This was the beginning of the desire for a small portable camera obscura.

The Camera Obscura in the Seventeenth and Eighteenth Centuries. Construction of truly small portable camera obscuras did not begin until the

middle of the Seventeenth Century. The earliest recorded example of a small, portable camera obscura is found in the work of Pierre Herigone of Paris, published in 1642. (14, page 26) Johann Zahn, in 1665, published a very extensive work devoted to the study of optics that includes a description of a camera obscura which he provided with a lens mounted in a tube. He also gives details as to the design and the effect of the focal length of the lens upon the size and scale of the image. (3, page 43) Zahn also describes a camera obscura that incorporated the use of a mirror to reflect the image upward onto a sheet of ground or frosted glass. (3, page 43) This particular type camera obscura had the advantage that the image was not upside down and the artist could trace the image by simply laying a thin piece of paper on the glass.

During this period, the camera obscura became very popular with the artist. Count Francesco Algarotti, in his "Essay on Painting" (1764) made this statement,

> The best modern painters among the Italians have availed themselves greatly of this contrivance; nor is it possible they should have otherwise represented things so much to life. (13, page 9)

Charlatans also made use of the camera obscura by persuading naive and ignorant people that what they were seeing was a manifestation of the occult science of astrology or of magic. Zahn describes the "magic vase" illusion of the charlatans in second and third installments of his "Oculus Artificials" published in 1686. By the use of mirrors and lens, it was possible to make dogs appear to be swimming in the water of a vase. (14, page 29)

The making of silhouettes was a very popular use of the camera obscura. (13, page 10) By this device, the middle class was able to obtain

cheap portraits that did not require the trained hand of the artist.

There seems to be no evidence that during this period anyone thought of capturing the image seen on the ground glass. The chief improvements were in the field of reproduction. New and better ways of tracing or reproducing images seemed to be the chief interest. The camera, as it became known, was a very definite step in the discovery of photography. The development, refinement, and uses it was put to during this period played a part in the science of today's photography.

It may be said that during the Seventeenth, Eighteenth and early Nineteenth Centuries the camera obscura was primarily an implement of the artist, a means of amusement, a device of mystery, and an aid to astronomy. During this period many discoveries were made which led to the improvement of the optical system, but no notable discoveries were made in the principle, design, or use of the camera obscura.

Section 2

Photochemistry

The desire to form a permanent image by the use of the camera led to another step in the development of photography, "photochemistry", or the chemistry of light. Today it is known that photography is a science involving both physical and chemical processes. There seems to be a great argument among the historians as to whom to give credit for the discovery of the processes of photochemistry. The author of this thesis makes no attempt to prove credit for this discovery. The fact that chemistry is a definite part of photography makes this brief history of the notable discoveries in this field a part of the history and development of photography.

Photochemistry Before Schulze. A more detailed history of photochemistry could start in the days of Aristotle and Pliny with the observation of the changes in certain substances when exposed to light and atmosphere. Pliny, in the First Century, recorded observations of the sensitivity of silver salts. (10, page 3) Many observations were made concerning the light sensitivity of various metalic salts before the Eighteenth Century, but in most cases it was attributed to the effects of heat and not light. In the year 1727, Schulze discovered by accident that light and not heat was the factor that produced a darkening of the silver salts.

Johann Heinrich Schulze. Johann Heinrich Schulze (1687-1744), in 1720, was appointed professor of medicine and in 1729 also professor of Greek and Arabic at the University of Altdorf. In 1732, he left Altdorf and was appointed professor of medicine, of rhetoric, and of archaeology at the University of Halle. (3, page 60)

It was during his stay at Altdorf that Schulze devoted much time to the study of chemistry. He became interested in reproduction of the luminous stone of Baldwin (a phosphorescent substance discovered by Christoph Adolph Baldwin in 1674 by mixing chalk in nitric acid). (3, page 57) Quite by chance, Schulze used nitric acid containing nitrate of silver. He was surprized to find that the surface exposed to light had darkened while the side turned away from the light was unchanged. (3, page 61) Schulze continued his investigation of this phenomena and concluded that light and not heat caused the darkening of the silver salts. (3, page 61) While experimenting with stencils, he discovered that he could produce words or sentences by holding the stencil against the glass container and exposing it to light. A mere shake of the jar prepared his solution for

a new light impression. For this discovery and the fact that images were formed by the action of light, Schulze is often noted as the first to employ photographic printing processes and thus is the inventor of photography in its first inception. (3, page 62) In later investigations, Schulze found that the use of mirrors and condensing lens would intensify the light and thus hasten the darkening of the silver solutions. (3, page 76) He also coated paper with solutions of silver chloride and made copies of stencils by exposure to light. (10, page 4)

Scheele. After the discoveries of Schulze became known, there were many studies made that presented new material to the growing science of "photochemistry". Time and space allow only mention of those discoveries that directly lead to the science of photography.

Carl Wilhelm Scheele (1742-1768), a Swedish chemist, in 1777 was the first to give definite statements on the photochemistry of silver cloride. (3, page 97) He based his studies directly on the works of Schulze and verified that chloride of silver remained unchanged in the dark. He was the first to study the effect of a prismatically dispired spectrum. He found that blue light was more effective than red light in reducing silver. (7, page 6)

Wedgwood and Davy. No history of photography could be complete without reference to Thomas Wedgwood, for to him must be given the credit of being the first photographer. (3, page 139)

Thomas Wedgwood (1771-1805), an English scientist, was the first to visualize the camera obscura as a means to obtain a permanent image. (3, page 139) He first devoted his study to methods of reproduction of designs on glass. In 1802, a publication appeared that described a process

of copying paintings on glass and of making profiles by the use of light. (3, page 136) In this paper a process is described as to how a coating of silver nitrate can be put on leather or paper and by passing light through a painting, a stencil, or even leaves or butterfly wings, a copy could be made. (14, page 60) Although much credit can be given to Wedgwood for his discoveries in photochemistry, his work might have meant little were it not for his collaborator, Humphry Davy.

Sir Humphry Davy (1778-1829), who became one of England's great chemists (3, page 139), worked very closely with Wedgwood. A paper, "An Account of a Method of Copying Paintings Upon Glass, and of Making Profiles by the Agency of Light on Silver Nitrate", by T. Wedgwood, with observations by H. Davy, appeared in 1802. (10, page 5) In this paper appears for the first time an account of the production of silver chloride paper by successive applications of silver nitrate and of chloride solutions. (3, page 139) Davy also tells how he inserted microscopic objectives in a solar microscope and projected the image onto sensitized paper. Thus the projection of images by photography, which includes the photographic enlarging process, can be credited to Davy. (3, page 140) Recognition must also be given the Davy initial production of iodide of silver and the recognition of its sensitivity to light. (3, page 139) The work of Wedgwood and Davy cannot be denied a place of honor in the history of photography in the development and applying facts already known to photochemistry. (3, page 140) Mention must be made that neither Wedgwood or Davy was successful in fixing, or making permanent, an image. (3, page 139)

Section 3

Heilography and Daguerreotype

Niepce. Joseph Nicephore Niepce (1765-1833), a member of a wealthy French family, was trained for the priesthood. (7, page 9) During the revolution he became an army officer, but due to his bad health, he was dismissed. He returned to his home at Chalon-sur Saone in 1794. He later turned his attention to invention and became interested in the lithographing process which was invented in 1797. (3, page 194) About 1814, he was attempting to find a method for the automatic transfer of pictures to the lithograph block. (7, page 9) There is no record of Niepce's experiments. The only information about his work is found in letters to his brother, Claude. In these letters reference is found to a camera he made from a ring box which he fitted with a lens from his grandfather's solar microscope. (10, page 7) With this camera, he made negative images on white paper (which is assumed to be silver chloride paper) which he described in a letter to Claude dated May 5, 1816. (3, page 195) Further experimentation led to the coating of metal and glass plates with layers of bitumen which were exposed through transparent tracings. The exposed metal plate was then bathed in oil of lavender which removed the bitumen from the exposed areas of the plate. The plates were then etched, and the remaining bitumen produced an image in relief which was printed in an ordinary printing press (10, page 7) Niepce named this process "Heliogravure". Prints made by this process are still in existence.

The year 1822 is the date set by many historians as the date for the first photograph made in the camera. (3, page 201) Niepce is honored as being the first to obtain and fix an image of the camera. (14, page 99)

Some authors establish this date for the invention of photography and give the honor to Joseph Nicephore Niepce.

Daguerre. The first real advance towards a practical process in photography came about through the joint work of Niepce and Daguerre. Louis Jacques Mande Daguerre (1787-1851) was a French painter who became well-known for his "diorama". In early childhood, Daguerre showed exceptional ability for drawing. His early training under Degotti, a well-known scene painter of this period, enabled him to attain a great proficiency in perspective and lighting. (3, page 209) About 1820 he became interested in improving the panorama, a series of paintings that gave the illusion of space. The "diorama", as his spectacle was known, consisted of a landscape, real objects, and painted objects that were arranged and lighted in such a manner as to give an illusion of reality and space. (14, page 110) The excellent lighting and manner in which the scenes were changed produced the effect of realism.

On a summer day in 1823, Daguerre noticed an image of a tree that was projected onto a newly finished painting by light passing through a hole in the shutter. He was greatly surprised the next day to find that the image was still visible. This gave him the idea of trying to fix the image of the camera. After much thought and time spent in trying to reconstruct the materials in the painting, he remembered that he had mixed iodine with his colors. He then began research into the sensitivity to light of iodine and iodides. (14, page 114) During his study of the mystery of light, Daguerre was told of Niepce's work by the Paris optician Charles Chevalier, who furnished lens to both Daguerre and Niepce. (14, page 115) Daguerre wrote Niepce in January 1826 and January 1827, but could not prevail upon

him to discuss his work nor could Niepce convince Daguerre that he was to be trusted with the secrets of his process. (14, page 117) The meeting that was to give the world a working process in photography came about through the illness of Niepce's brother, Claude. While waiting in Paris for passport clearance so he could visit Claude, Niepce took the opportunity to visit the "diorama" and Daguerre. Niepce later wrote to his son that Daguerre's research had no object other than curiosity. (14, page 120) In October 1829, Niepce offered to cooperate with Daguerre for the purpose of perfecting the heliographic process and to combine their efforts in order that they might obtain complete success. (14, page 125) Thus Niepce contributed the heliographic process and Daguerre contributed his improved camera, his name, and fame to the firm "Niepce-Daguerre".

Niepce's son, Isidore, took his father's place in the firm after Niepce's death in 1833. Daguerre found that Isidore was not interested in research and was concerned only with the financial side of the processes. In the meantime, Daguerre had improved his process to such a point that in 1837 he could produce a brilliant detailed picture. (13, page 17) At this time Daguerre convinced Isidore that the contract should be changed. Daguerreotype, as Daguerre's process was called, was to be made public at the same time as heliography in order that Niepce's name could be associated with the work. (13, page 17) Isidore agreed, after he found there would be no change in the financial arrangements of the contract. The new contract provided that the Daguerreotype process would be exploited by public subscription or sold for not less than 200,000 francs. (14, page 153)

They failed to find financial support for the process. Daguerre set

about to publicize the process and to interest men of science in its value. He finally turned to Francois Arago, director of the Paris Observatory, who lectured to the Academy of Science about the process and its potentials. (13, page 17) Arago further proposed that the French government buy the process if further investigation proved it practical and useful. On July 30, 1839, the purchase was approved and provided for an annual pension of 6,000 francs for Daguerre and 4,000 francs for Isidore Niepce. The extra 2,000 francs approved for Daguerre was for the releasing of the secrets of the "Diorama". (13, page 17) The "Diorama" was destroyed by fire on March 3, 1839. This, plus loss of interest through seventeen years of exploitation of the "Diorama", caused Daguerre to agree to describe his process. (14, page 159) The world now had the first practical photography process.

The daguerreotype is a thin copper plate which has been coated with silver. The silvered surface is rubbed to produce a smooth dull surface. The plate is now exposed to fumes from iodine which form a coating of silver iodide that will retain the latent image of the camera. Exposures for this plate are said to have varied from five to forty minutes depending upon the light conditions. After the exposure, the plate is exposed to vapors from heated mercury. These vapors settle on prepared surfaces and combine with this surface to form the image. When the development is complete, the plate is washed in a solution of distilled water which is saturated with common salt, sodium chloride, or hyposulphite of soda. (14, page 164)

Section 4

Developments Following Daguerreotypes

Herschel. John Frederick William Herschel (1792-1871), an English astronomer, discovered the fixing properties of sodium hyposulphite in 1819. He described his discoveries in the "Edinburgh Philosophical Journal" of 1819, but Daguerre, Niepce, and others experimenting with silver compounds undoubtedly did not know that the fixing agent they were seeking had been discovered. (3, page 170) When the world learned of the Daguerre process in 1839, Herschel again called attention to the fixing properties of hyposulphite and it replaced the use of salt as a fixing agent.

Commercialization of Daguerreotypes. Daguerreotypes brought about the birth of a new industry, the manufacturing of equipment and supplies for the new art of photography. In 1839, the Daguerre-Giroux firm was formed to produce the camera for his process. (3, page 250) Other firms produced lens, accessories and chemicals needed for the process.

Talbot. William Henry Fox-Talbot (1800-1877) was a well-to-do Englishman who devoted himself to the study of science. Talbot is to be honored as the first to discover a means of producing a negative image that could be used to produce any desired number of prints by contact printing from a paper negative. He began his investigation without knowledge of the work of Niepce and Daguerre. He became acquainted with the work of Wedgwood and Davy, and began experimenting with silver chloride paper. Talbot later experimented with silver bromide paper which he found to be more sensitive to light than the chloride paper. He laid the foundation for the present-day printing processes of chloride and bromide

papers. In 1840 he was working with silver iodide in hopes of producing a more sensitive paper and by accident discovered that a latent or slightly visible image could be intensified with gallic acid. He employed the use of sodium thiosulfate as a fixing agent and the results were a permanent paper negative. By treating this negative with wax, he was able to produce a transparent negative from which positives could be printed on silver chloride paper. He called this process "calotype", from the Greek word "kalos", meaning "beautiful".

Although the "calotype" process was much cheaper than the daguerreotype process, it did not achieve wide use due to the lack of sharpness of the waxed paper negative and the patent rights that Talbot enforced. In 1843 Talbot told how to produce a large paper negative by the use of a lens from a small calotype and thus produce any desired size print. Talbot, then, is the forerunner of our modern enlarging process. There is evidence that Talbot produced negatives in the camera from which he made prints in 1835. This account was read the day before Daguerre's process was announced, but due to lack of evidence and the poor quality of the pictures, the work was not accepted. (3, pages 316-324)

Petzval's Portrait Lens. The early Daguerre cameras were equipped with a single lens. This type of lens had to be used at a small aperture in order to produce sharp results, thus necessitating very long exposures. One of the first to see the possibility of improving the camera lens was Josef Max Petzval (1807-1891), a member of the Vienna Academy of Science. He undertook the calculation of a new larger aperture photographic lens. Petzval devoted his study to this problem early in 1839, and designed a portrait lens and a rapid lens for landscapes which later was called

"orthoscope". Petzval entrusted the manufacture of these new lens to the German optician Peter Friedrich Voigtlander. Voightlander completed the construction of the first lens in May 1840. It was the portrait lens. The portrait lens admitted sixteen times as much light as the commonly used Chevalier lens. Exposures were cut from minutes to seconds. The lens were of the doublet type and made of hard crown and light flint glass. Petzval is to be honored for introducing the lens that was to make portraits and instantaneous photography possible. (3, pages 289-293)

Bayard. Hippolyte Bayard (1801-1887), a French amateur photographer, developed one of the first processes for producing a positive print in the camera. Although the Daguerre and Talbot processes followed the work of Bayard, he did not receive the credit and honor for his work until a much later date. Bayard presented the Academy of Science, on November 11, 1839, with a sealed envelope containing prints and an account of the process by which they were made on October 24, 1839. This process was made public February 24, 1840, by the Academy of Science. Bayard's process consisted of coating paper with silver chloride which was exposed to light until it was completely blackened. Just before making the exposure, the paper was submerged in a four per cent solution of potassium iodide, and while still moist, laid on a slate and placed in the camera. The portions acted upon by light were bleached and this formed a positive image by the separation of the iodine from the potassium iodide and the combining with the blackened silver image. This process was never used professionally, but many prints are in existence today that give evidence of the lasting quality of this process. (14, pages 183-189)

Niepceotypes. Photography to this time had developed from paper, to metal, to paper, and now to glass. The calotypes, paper negatives, had the advantage that they could be reproduced and any desired number of prints could be made. The coarse structure of the paper, however, limited the use of this process.

Claude Felix Abel Niepce de Saint-Victor (1805-1870) was a cousin of Nicephore Niepce and he is to be credited for inventing the process of producing an image on glass. He called his process "Niepceotype" but the name "glass negative" soon became more popular. He was searching for ways to improve the heliographic process to make it more useful and practical. In 1847, he began experimenting with glass and trying to find a means to bind the iodine coating to the glass. He tried both starch and gelatin, but he found that albumen was more preferable. He also found that a mixture of honey, syrup, or whey, mixed with the albumen, would increase the sensitivity of the plate. Niepceotypes were made by mixing potassium iodide in fresh albumen to form a mixture which was used to coat the glass plate. After drying, the plate was immersed in a silver nitrate bath and then exposed in the camera. The image was developed in gallic acid and fixed. The result was a sharp transparent negative, free from the coarse paper texture, that could be used for any number of printings.

Many improvements were made in this process during the next few years. One was the introduction of glass projection pictures, or lantern slides. The two Angeheim brothers of Philadelphia started their work in 1846, and in 1850 patented the process under the name of "hyalotypes". (3, pages 338-341) The invention of Niepce de Saint-Victor started the transition period from daguerreotype to photography with a transparent negative. The

discovery of the wet-collodion process brought an end to the daguerreotype era.

Section 5

The Wet Collodion Plate

Le Gray. Gustave Le Gray, a French painter, turned to photography as a means of improving his financial condition. Le Gray was interested in producing negatives on glass plates. On June 1850, he made photographic plates by substituting a solution of collodion cotton in ether for the albumen. Collodion is a substance formed by dissolving guncotton in either and is generally credited to Louis Menard in 1847. Le Gray had little success with the process and merely can have the distinction of being the first to suggest the possibility of using collodion in photography. (3, page 345)

Archer. Frederick Scott Archer (1813-1857) turned his attention to collodion in 1849 and in March 1851 published an account of his work. He gave the world a practical means of producing negatives and thus dealt the death blow to daguerreotypy.

Archer's process is called "wet-collodion" because the glass must be coated, exposed, and developed before the collodion has dried. A clean glass plate was coated with collodion containing potassium iodide and then submerged in a solution of silver nitrate. It was exposed in the camera while still wet, developed in a solution of pyrogallol and silver nitrate, and finally fixed in sodium thiosulfate or hypo. Since the plate must remain wet, it was necessary to take a dark tent along when the photographer made outdoor photographs. The tent was erected and used as a darkroom in which to prepare and develop the plates. An account of the

wet-collodion process, published in 1851, was so detailed and perfected that it is still in use today in certain fields of printing. (10, page 16)

A unique feature of the Archer process was the ability to strip the emulsion from the plate. This meant that one glass plate could be used any number of times. The collodion bearing the negative image could be stored and handled without the danger of breaking the glass base. Archer also prepared positives by simply mounting the plate on a dark material or painting the back black. These positives became known as "ambrotypes" in America. A more popular imitation appeared in 1856 under the name "melainotype", but was later changed to "tintype". The tintype was made by substitution a thin metal plate, painted black, for the supporting base of the collodion instead of glass plate. (13, page 55-58) The tintypes had several advantages over other materials; namely, they were light in weight and unbreakable, and it was a simple matter to trim the plates to fit frames, lockets and brooches.

Section 6

Dry Plates

The improvement in sensitized materials advanced very rapidly from 1839. Daguerre's process was in common use until 1851, when the discovery of the wet-collodion process by Archer became the accepted means of making photographs. Early users of the wet-collodion plates could see a distinct advantage in the preparation of a dry plate. Many attempts were made to perfect such a plate but few met with success. Space does not allow the discussion of these processes as the majority did not prove to be practical. The first successful dry plate was reported in 1871 by Richard L. Maddox.

Maddox. Richard L. Maddox (1816-1902), an English physician, discovered a means of making a dry gelatin silver bromide plate in 1871. Maddox's invention made all the collodion process of the period obsolete. With his material, the manufacturer was able to produce plates that could be stored for months before use. There was also the important factor of a speed increase. Maddox was not the first to employ gelatin as a vehicle for the silver. The recorded information is found in the work of Niepce de Saint-Victor. However, Maddox can be remembered as the first to produce a workable gelatin emulsion that was practical. (7, page 15)

The First Dry Plate. The first gelatin emulsion that was offered for sale appeared in July 1873. This plate was the work of J. Burgess, an Englishman, and he is established as the first to produce a gelatin emulsion that was of a practical and suitable quality for the trade. (3, page 424)

Azaline Plates. One of the great advances in photography during this period was the discovery of a means to make the emulsions sensitive to all colors. Hermann Wilhelm Vogel (1854-1901), a German scientist, discovered in 1873 that certain dyes could be added to the collodio-bromide emulsion that would make it sensitive to different parts of the spectrum. By 1884 he had perfected a dye mixture called "azaline" that made possible the first "panchromatic" (sensitive to all color) plates. Vogel started the search for new dyes that eventually led to color sensitive black and white plates and to processes that produced photographs in color. (3, pages 458-464)

Eastman Emulsion Coating Machine. There were many dry plates appearing on the market after 1873, all of which were coated by hand. The first

machine coated plates were made by the Eastman Company (to be discussed later) which was granted a patent for an emulsion coating machine on April 13, 1880. (10, page 20)

Section 7

Photographic Paper

Silver Bromide Paper. Peter Mawdsley, the founder of the Liverpool Dry-Plate Company, pointed out the possibilities of utilizing gelatin silver bromide paper as early as 1874. It remained, however, for Sir Joseph Wilson Swan, co-inventor with Edison of the carbon filament bulb, to first undertake the manufacture of such paper. He applied for an English patent in 1879 and began the manufacture of bromide printing paper. (3, page 439-440)

Silver Chloride Paper. An account of the production of positive paper prints made with gelatin silver chloride emulsion was published in Vienna in 1881 by J. M. Eder and G. Pizzighelli. This process is of notable importance in that a chemical developer was used instead of gallic acid as in the previous processes. Dr. E. Just, of Vienna, began the large scale manufacture of silver chloride paper in 1882. (3, page 445) The most famous of these papers was introduced by Dr. Leo Baekeland in 1893 under the name of "Velox", the first gaslight paper. (3, page 446) The manufacture of this paper was taken over by the Eastman Kodak Company in 1899. (26, page 8)

By 1890, photography had grown to a world-wide business. Advancements were made in known processes, new processes were being discovered, and new equipment and uses for photography were being invented. Photography had been established. The scope of this study cannot be extended

to cover the many discoveries that were to affect the science of photography. The evolution of color photography, the designing and improvement of the camera, the chemical developments and discoveries are a few of the many factors that would be worthy of further study in tracing the complete history and development of the science of photography.

Part B

American Contributions to Photography

Today, America can be considered the world's largest source of photographic materials. The resources of America, the foresightedness of Americans, and the ingenuity of the manufacturers are the factors that created this field of industry. American contributions have helped make photography the valuable aid to science, industry and education that it is at the present time.

Section 1

The Daguerreotype Period (1839-1840)

The early developments and discoveries that were essential in establishing photography were made in Europe. The discovery of the daguerreotype process marks the beginning of photography in America.

Morse's Visit to Paris. Daguerre's process, for making daguerreotypes, had awakened the world to explore this new and fascinating means of pictorial representation. The first American to become acquainted with the process was Samuel F. B. Morse (1791-1872). Morse was in Paris in January 1839 securing a French patent for his electro-magnetic telegraph and at the time, Daguerre's process was receiving great publicity. Today, Morse is known primarily as the inventor of the telegraph. His early life had

been partially devoted to art and he achieved considerable distinction as a portrait painter. He was president of the "National Academy of Design" for the eighteen year period from 1827 to 1845. Morse had studied science at Yale and apparently had experimented with the camera obscura and had tried unsuccessfully to fix the image. With this background, the daguerreotype process was of natural interest to him. A meeting was arranged with Daguerre. At this meeting Morse was extremely impressed with Daguerre's work. History indicates that Morse attempted to duplicate the process upon his return to America. Admissions by Morse himself indicate that he was not able to produce a successful daguerreotype until the written account by Daguerre was published. The date September 20, 1839, marks the beginning of practical photography in America, as this is the date Daguerre's process became known in America. (16, pages 8-17)

First American Daguerreotype. Many claims were made for the honor of having produced the first daguerreotype in America. This honor has been credited to Morse, but evidence shows that D. W. Seager actually produced the first daguerreotype in America on September 27, 1839. Very little is known of Seager. He was an Englishman residing in New York at the time he produced the historical daguerreotype. He gave lectures for a few months on the art of taking daguerreotypes. Except for the claim of being the first to produce a daguerreotype in America, there is no evidence of any other advancement he made to the history of American photography. (16, pages 15-17)

Other Contributions of Morse. Morse turned to making portraits by daguerreotype as a source of income. He is sometimes credited with making

the first daguerreotype portrait, although evidence shows he cannot claim the honor. His fame as an inventor of the telegraph and as president of the National Academy of Design gave him the prestige to become a very successful teacher of photography. The list of his students contains many names that later became well known in the field of photography. Among these students were Edward Anthony, founder of the photographic supply house of E. Anthony and Company; M. B. Brady, who became famous for his photographs of the Civil War. Morse is called "Father of American Photography" more for his achievements as a teacher than his claim as having produced the first daguerreotype and the daguerreotype portrait in this country. Morse can be credited as the first to produce a picture of a college class. The first class picture was made at a reunion of the Yale Class of 1810 which met August 18, 1840. (16, pages 37-38)

John W. Draper. Dr. John W. Draper (1811-1882) was professor of chemistry at the University of the City of New York at the time Morse was professor of literature of art. He had previously experimented with the action of light on silver iodide and bromide. He readily saw the importance of Daguerre's discovery and soon became associated with Morse in experiments with daguerreotype. From his previous investigation with light, Draper soon found that the rays from the lens formed images that were best for visual focus did not produce the best daguerreotype image. He found the actual focus, to produce sharper images, to be closer to the lens. It was this knowledge that made Draper's work the best produced during this period.

Draper also claimed to be the first to produce daguerreotypes in America, as well as the first to produce a portrait by daguerreotype. Draper's importance to American photographic history lies in his attempts to take

portraits by applying scientific principles. He was one of the first to produce portraits, one of which survives today, that may be considered the earliest remaining portrait. Draper employed mirrors as a means of directing the sunlight on the subjects. He wrote and published many accounts of his experiments which enabled others to take advantage of his work. He was an associate of Morse in opening an establishment for taking portraits, thus one of the founders of a new profession. (16, pages 18-33)

The First Daguerreotype Portrait. Alexander S. Wolcott (1804-1844) was an instrument maker and manufacturer of dental supplies. He was well acquainted with optics and immediately conceived the idea that the exposure could be reduced by a different optical system. A new device was designed that employed a concave reflector of large diameter and short focus that reflected the image onto the sensitized silver plate. By using this device, Wolcott made a 2" x 2½" portrait in October 1839. Wolcott is to be remembered as having produced the first daguerreotype portrait. He also received the first photographic patent issued in this country. This patent, issued May 8, 1840, deals with Wolcott's method of producing portraits by the use of a concave reflector. He also established what may have been the first professional studio, or "Daguerrean Parlor" as it was then called. This process was used extensively by the professional daguerreotypists of 1840 and 1841. (16, pages 33-37)

Matthew B. Brady, Photographic Historian. Matthew B. Brady (1823-1896) had an early desire to become an artist. It was while studying art that Brady became a student of Morse and in 1844 opened his first studio in New York City. His early years in photography were spent experimenting

to produce the best possible results of the new art. In 1845, he began a project of collecting portraits of all the distinguished and notable individuals. Today, he ranks high as a historian for this effort. His collection of photographs of the presidents of the United States was complete from John Quincy Adams to William McKinley, with the exception of William Henry Harrison. (16, pages 55-62)

Brady is well known for his photographs of the Civil War. When the war started in 1861, Brady felt a need for photographic documentation to record the events of the war. He obtained permission to wander where he chose and in a short time discovered the dangers and difficulties of combat photography. This venture almost cost Brady his life and put him so deeply in debt that he lost control of his negatives. (13, pages 85-87) Brady can be honored as a photographic historian who conceived the idea of photographic history and managed to carry his idea to completion. (16, page 59)

A more detailed history would include the change from the daguerreotype to wet-collodion plates and on to paper prints. As this history section is intended to bring forth only new discoveries or events that were of major importance to developing photography in America, only brief mention will be made of certain changes that have been discussed in previous sections. The transition from metal to glass plates in America began as early as 1849. John A. Whipple, a daguerreotypist from Boston, and Frederick Longenheim of Philadelphia, made attempts to prepare glass plates with albumen, but were unsuccessful. It was after Archer's discovery in 1851 that the wet-collodion plate came into common use. Whipple became the leading authority on the use of paper for prints during 1853. His efforts were

important in establishing paper printing although he did not develop the process. The era of "ambrotypes" and "tintypes", which were modifications of the daguerreotype, flourished as cheap portraits for a brief time. Many improvements were made in processes and equipment during this period although no new developments can be credited to Americans.

Section 2

Attempts to Stop Motion

Motion became a problem when photography had reached a stage where it was no longer necessary to use inanimate objects for models. Eadweard Muybridge (1830-1904) was commissioned by Leland Stanford in 1872 to attempt to photograph the gallop of a horse. Although the first attempt was made in bright sunlight, the wet-collodion plate recorded only a slight image. Stanford and Muybridge saw the possibility of obtaining successful photographs of action. Muybridge was commissioned to proceed with his efforts. In 1877, by using a battery of cameras and a new improved collodion process known as "lightning process", Muybridge succeeded in producing a series of multiple photographs showing the consecutive stages of action. The cameras were tripped by strings, which were fastened to the shutters, that were broken as the horse galloped by. The results of this project received wide publicity.

Muybridge later went to Paris where he worked with the French scientist Etienne Jules Marey (1830-1904) who was also interested in research in the gait of animals. Marey improved the methods of Muybridge and designed a camera that took twelve successive exposures on a dry plate. Muybridge continued to use a battery of cameras but with electrically synchronized shutters. (12, page 2011)

In 1879, Muybridge designed an instrument which he called a "zoogyroscope", but later changed to "zooprariscope". This was a projection lantern that contained a number of photographs printed on a glass wheel that could be rotated. By using a shutter and rotating the glass wheel, the illustion of motion was produced. Early work of Henry R. Heyl along this same line prevents Muybridge from claiming the honor of founder of motion pictures. Muybridge's work had a great influence in the field of art, especially in depicting animals in motion. (16, pages 406-412)

Section 3

George Eastman's Contributions

Photography was well established by 1878. The wet-collodion plate was presenting new avenues for industry and the opportunities of a new profession. America was on the way to becoming a world power in the field of photography. The announcement of a dry plate and Eastman's entry into the field of photography began a period that has made America a foremost authority in photography and its uses.

George Eastman. No history of photography could be complete without reference to George Eastman. His ability to foresee needs and his ingenuity in producing materials have made him a leading figure in the eyes of the photographic world. In the late seventies, George Eastman (1854-1932) was living in Rochester, New York, and employed as a bookkeeper by the Rochester Savings Bank. He became interested in visiting Santo Domingo and decided he would use his savings for a vacation there in 1877. (16, page 378) By chance he told about his proposed trip to a fellow employee who suggested that Eastman take along a camera so as to have a record of

his trip. This idea appealed to Eastman and he hired George H. Monroe, a local photographer, to give him lessons in the art of photography. This first lesson cost $5.00 and was the turning point in his life. He began to master the art and when his vacation time came, he cancelled the trip to Santo Domingo and spent the time on Mackinac Island taking pictures. Eastman stated later that at this time there were only two other amateurs, besides himself, in Rochester. (16, page 378)

It has been suggested that an accident involving a bottle of silver nitrate that leaked while packed in his trunk and stained his clothes, may have started Eastman's interest in dry plates. (16, page 379) Eastman became an ardent reader of the various journals of photography and at this time the interest was centered on the discovery of dry plates. His memory of the hot days spent in his darkroom tent preparing wet plates and the loss of his clothes caused Eastman to become very interested in the dry plate as it could be prepared for use in advance.

Eastman's First Laboratory. Eastman's first laboratory was set up in his mother's kitchen. He worked in the bank by day and devoted his nights to study. In the summer of 1878, he succeeded in making satisfactory gelatin plates. The first Eastman factory was started in 1879 in an upstairs room by Eastman and one helper. His plates were accepted by the local photographers and in a short time the little factory could not keep up production. In 1879, Eastman made a trip to England to study the methods of producing dry plates. He became acquainted with the Anthony Company and contracted to supply his plates to them. While in England, he also applied for a patent for an emulsion coating machine for the mass production of dry plates. A United States patent was issued on April 13, 1880.

Eastman Dry Plate Company. The Eastman Dry Plate Company was formed January 1, 1881, by Eastman and Colonel Henry A. Strong. (26, page 3) The factory began operation and for awhile the future looked bright. Then the plates that had been stored lost their sensitivity and it became necessary to recall these plates. This caused a great financial loss and the factory was closed. Eastman continued to try to locate the source of the trouble. In 1882, Eastman gave up the search and went to England where he purchased the formula for England's best dry plate, the Mawson and Swan. The factory was reopened and soon showed a substantial profit. The first enlargement of factory facilities were made in 1883. Eastman proudly wrote Anthony that the new building would be four stories high and sixty by ninety feet, and would be lighted with incandescant light from a sixty light Edison dynamo. From this time, the Eastman Company has continued to build and expand.

The First Flexible Film. A need had long been felt for a flexible negative material. Eastman became interested in this problem and by 1884 he succeeded in producing a practical film for photography. The film, a thin coating of emulsion on a high-quality paper, was cut into twelve and twenty-four exposure lengths. William H. Walker, an associate of Eastman, devised a roll holder for the new film that would attach to a plate camera. The problem of the paper texture was overcome by treating the film with glycerin.

The next development was the "stripping" film. In this process the emulsion was soaked loose from the paper backing and the gelatin image was transferred to a thin gelatin "skin". When the two gelatin layers were dried, they became one, thus a transparent negative that needed no greasing.

The First Kodak. The success of the roll holder and roll film brought out the idea of making the roll holder a part of the camera and not an accessory. There were still only a few amateurs. If picture taking could be simplified, it would become a universal habit. This was the dream of Eastman. The word "Kodak" was coined by Eastman as a trade name for his camera. The first Kodak appeared in 1888. It sold for $25.00 and was loaded to take one hundred exposures, $2\frac{1}{2}$ inches in diameter. For $10.00 the owner could have the film developed and printed, and have the camera returned, loaded for another one hundred exposures. The slogan for the Kodak was, "You press the button -- we do the rest". With the appearance of the Kodak, a new field of interest was opened to the public. Also, a new business, "photo-finishing", was born.

Transparent Film. Before the stripping film was marketed, Eastman saw the need for a transparent, yet flexible, film. A search was made for a suitable base. In 1889, the Eastman Company introduced the first commercial transparent film on a nitrocellulose base. Although Eastman was the first to produce such a film commercially, it was later proved in court that the credit for this discovery belonged to Hannibal Goodwin. Goodwin was in search of materials to use in lectures and turned to photography as a source. He became interested in finding a substitute for the glass base and after ten years of work, he applied for a United States patent on May 2, 1887, for the making of a "photographic pellicle". Eastman applied for a patent in 1889, but withdrew his application. Henry M. Reichenback, a chemist employed by Eastman, was issued a patent on December 10, 1889, for the making of a nitrocellulose film. This film was marketed in 1889, and became a great success. The demand for this new film

became greater with the introduction of "daylight loading" film which was marketed in 1895. The method of protecting the film from daylight was invented by Samuel W. Turner, but was purchased by Eastman.

A Camera for $7.00. The daylight loading film opened a new market. The amateur could now develop his own film. The film, the paper, and the processes were available. All that was needed was a simple camera. Eastman marketed the "Pocket Kodak Camera" in 1895. Now a pocket Kodak was available for $5.00 or a Brownie Kodak for $7.00. Everyone could take pictures.

Thomas A. Edison. Edison had been experimenting with his motion-picture camera for some time. He had reached a point where it was necessary to have a flexible film if he were to produce continuous motion. Edison had patented the "Kinetograph" (the camera) and the "Kinetoscope" (the viewer) in 1891. He turned to Eastman in 1889 and asked him to supply his new flexible film. Edison specified the width of the film to be approximately 35 mm. and punched with four sprocket holes on each side of a frame which was to measure 1 x 3/4 of an inch. This standard has been adopted internationally. (12, page 2023) The film proved a success and was placed on the market in 1896. With the new film, Edison's "Kinetoscope" became a popular type of entertainment. Short films, about fifty feet in length, were shown of prize fights, vaudeville acts, and other interesting subjects.

By 1900 photography was a leading business. It remained only for new improvements and uses to be discovered to make photography a valuable part of the American life. The field of color photography has been omitted from this history, not because of unimportance, but due to the time needed to

report the various phases of its development. As early as 1861, James Clark Maxwell was able to reproduce a colored ribbon. The discoveries that led to the present-day color processes need to be reported in detail to be of value. It has been shown that by 1900 black and white photography, motion picture photography, and color photography were known and only needed improving to make the photographic processes of today possible.

Due to the wide scope of George Eastman's activities, the author wishes to explain the lack of footnotes in the previous section. No history of photography could be complete without references to Eastman. In this sense, apparently there is no one book containing the details of all his discoveries and advancements in the field of photography. The following sources were used as concurrent references for the section on George Eastman: Photography and the American Scene, Robert Taft (16); The Complete Photographer, Issues 1 and 31 (8 and 11); Modern Photography, Vol. 18, No. 1 (January 1954) and No. 2 (February 1954), (20 and 21); Selected Books on the History of Photography (32), Biography of George Eastman (26), History of the Eastman Kodak Company (27), Milestones in Photography (30), and Kodak Milestones (29), a series of booklets published by the Public Relations Department of Eastman Kodak Company; and Photography, C. E. Kenneth Mees (9).

Important Events in Photography Since 1890. The majority of the discoveries made in photography since 1890 are the results of group research by a company or a group of scientists. It is difficult to give credit to any one person. Photography today does not mean only taking pictures. It is a science of reproduction, a means of communication, a valuable teaching aid, a powerful medium of advertising, and a profession

for many people. The history would be envolved and difficult to trace.

The following events are listed in Milestones in Photography (30) as being of significance to the history of photography.

1890 The principles of sensitometry were established by Ferdinand Hurter and Vero C. Driffield.

Dr. P. Rudolph of the Carl Ziess Optical Works in Germany produced the first anastigmat lens.

1891 Gabriel Lippman produced color photographs by means of light interference.

1892 Frederick E. Ives invented a process for viewing three-color stereographic photographs.

1893 John Joly invented a three-color screen plate process.

Velox gaslight paper was introduced by Backeland.

1894 Gum bichromate printing was revived for pictorial work.

1895 W. C. Roentgen discovered X-rays and the science of radiography was founded.

August and Louis Lumiere introduced the cinematograph for taking and projecting motion pictures.

1896 Film specially coated for motion-picture positives was made by Eastman Kodak Company.

1899 A machine for coating film in continuous rolls was designed at the Eastman Kodak Company and placed in use.

1902 The Eastman Kodak Company introduced equipment for developing roll film in daylight.

1903 Gelatin backing on roll films to prevent curl was used by Eastman Kodak Company.

1905 Thomas Manly invented the Oxobrome (now Carbo) Process for the printing of pigment images.

1906 Wratten panchromatic plates were introduced by Wratten and Wainwright in England.

1907 A. and L. Lumiere marketed Autochrome three-color additive color plates.

1908 Eduard Belin and Arthur Korn developed phototelegraphy, or the transmission of photographic images by telegraph or telephone.

The Eastman Kodak Company first made safety (cellulose acetate) film. In improved form, this film was eventually to replace entirely the highly inflammable cellulose nitrate type used until this time.

1923 Eastman Kodak Company made amateur motion pictures practical with the announcement of 16 mm. reversal film on safety base.

Eastman Kodak Company was the first to introduce a 16 mm. motion-picture camera and projector for taking and showing pictures with the new film.

1924 The Bell and Howell Company introduced a spring-driven 16 mm. motion-picture camera.

The Leica camera, the first widely-sold "miniature" camera for making still pictures with 35 mm. film, was announced by the E. Leitz Company.

1928 With the introduction by the Eastman Kodak Company of 16 mm. Kodacolor film (a lenticular reversal film, later discontinued and not to be confused with the present Kodacolor for still cameras) motion pictures in color became a reality for amateur cinematographers.

Sound motion pictures were instituted on a wide scale commercially

following the use by Warner Brothers in 1927 of the Vitaphone sound system in the production of the motion picture "The Jazz Singer". Recordak microfilm equipment was introduced by the Recordak Corp., an Eastman Kodak Company subsidiary.

1929 Electric flashbulbs were invented in Germany by J. Ostermeier.

1931 New classes of sensitizing dyes began to come on the market and were one of the factors leading to the modern high-speed types of films and plates.

Kodalith Film for the graphic arts was introduced by the Eastman Kodak Company.

1932 Amateur motion-picture equipment in the 8 mm. size, with both black-and-white and Kodacolor, became available through the Eastman Kodak Company.

A photoelectric exposure meter was invented by the Weston Electrical Instrument Company.

1935 Kodachrome Color Film, invented by Leopold D. Mannes and Leopold Godowsky, and perfected by them in cooperation with the Kodak Research Laboratories, was announced in the 16 mm. size for motion pictures by Eastman Kodak Company.

1938 The Eastman Kodak Company announced Kodachrome Sheet Film for professional photographers.

The first lenses with reflection-reducing coatings were introduced by the Eastman Kodak Company. The process used came to be designated as "Lumenizing", and its development included a progressively greater degree of hardness in the coatings.

1941 A revolutionary optical glass, "rare-element" glass, was announced by the Eastman Kodak Company.

Airgraph, developed by the Eastman Kodak Company, was first used by the British for communication between London and the British forces in North Africa. In 1942, the process was adopted by the United States and used under the name "V-Mail" for communication between this country and all theatres of war.

1942 The Ansco Company brought out Ansco-Color film, a color film which could be processed by the photographer.

1945 The Kodak Dye Transfer Process, introduced by the Eastman Kodak Company in this year, presented a method for making three-color prints on paper from color-separation negatives.

1946 Announcement was made by Eastman Kodak Company of Kodak Ektachrome Film, a new color film for use in sheet-film cameras and adapted for processing by the photographer.

1947 The Eastman Television Recording Camera was placed on the market, a culmination of experiments conducted by the Allen B. Du Mont Laboratories, the National Broadcasting Company, and the Eastman Kodak Company.

1948 The Land Polaroid Camera was introduced by the Polaroid Corporation.

1949 Eastman Kodak Company announced Kodak Ektacolor Film, a color film intended for processing to color negatives by the user, along with Kodak Pan Matrix Film for making color prints from the negatives. The Kodak Flexichrome Process (a method of making prints and transparencies in full color from black-and-white or color originals by applying dyes of various colors to a gelatin relief image) was placed on the market. Invented and originally marketed

by Jack Crawford, the method was further developed and improved through the joint efforts of the Kodak Research Laboratories and Mr. Crawford, leading to its introduction by the Eastman Kodak Company as the Kodak Flexichrome Process in 1949.

1950 The award by the Motion Picture Academy of Arts and Sciences to the Eastman Kodak Company for the development and introduction of an improved safety base for professional motion-picture film, designed to replace the highly inflammable cellulose nitrate base heretofore used, climaxed many years of research directed towards this goal.

There have been many new products and processes discovered since 1950 but their history is not yet old enough to be recorded. The field of reproduction has had many new aids through photography, such as silk screen printing with Ektagraph film, reproduction of continuous tone material with Autoscreen film, and photographic templates in industry. At the present, new high-speed films are making photographs possible both in color and in black-and-white that could not have been made before these discoveries. The history of photography has not ended; it has just begun.

CHAPTER III

PHOTOGRAPHY AND THE OBJECTIVES OF INDUSTRIAL ARTS

The industrial arts division of today's education program is directed to study of industrial tools, machines, materials, and processes through the objectives of general education rather than those objectives of vocational education. Today's industrial world is dependent upon photography which has become an integral part of industry. Photography is an industry in itself. The place of photography in education becomes apparent if this fact is accepted.

Part A

History of Industrial Arts

Industrial arts belongs to the Twentieth Century. It is a particular phase of today's education that has developed through a series of philosophic patterns providing industrial or vocational education. Industrial arts is devoted to the objectives of general education; the vocational aspect has been eliminated. The history of the various movements that were responsible for the philosophy of industrial arts are presented in the interest of establishing the objectives of industrial arts.

Primitive Education. The objective of primitive education was the development of hand skills. Without these skills the early man had no means of providing the necessities of life. Through his hand skill, he

could fashion weapons for procuring food and for protection; he was able to provide clothing and shelter for his family. This skill was learned by unconscious imitation through association in the home or tribe. The father, as the provider, was the example that was imitated by the boys. The primitive education was the responsibility of the father. The objective was to obtain hand skills. Without this skill, the necessities of life were not obtainable and survival would be doubtful. Hand work was the essential element of primitive education. (1, pages 11-12)

Barbaric Education. The use of fire caused many changes in the existing living standards. Better food became available; food that was cooked. The smelting of metals made possible new weapons and tools. Better shelter could be constructed and more efficient clothing was fashioned. The discovery of new tools led to the founding of new crafts. Common interests drew the men together and groups or guilds were formed to develop skill in the crafts. Learning became a "conscious" process of imitation. The objective was to obtain skill in a particular craft. (1, page 12)

Religion in Early Education. Early education became a religious function. The early Jewish education devoted one half of the day to learning the laws of Talmud, the book of traditionary law of the Jews. The afternoon was spent with the father who taught the son a trade. Learning a trade was required by Jewish religion. The purpose was to prepare the boy to be a useful member of society. The early Christian monks and the Benedictines required manual labor as part of their teaching of religion. Certain hours were assigned to study and religious

practices, and other hours were set aside for labor. The production of books became the responsibility of the monks. New crafts and skills were developed to facilitate the production of books. The monastic schools were the primary source of education until the Sixteenth Century. (1, pages 13-21)

Apprenticeship in Crafts. The development of crafts into specialized skills brought about the practice of apprenticeship. The father was the first teacher of skills in hand work. Later the religious schools taught trades and crafts. As the need for skilled labor became apparent, new methods were sought to broaden education and produce more skilled labor. Education was acquired through an apprenticeship. The master gave the boy instruction in moral, religious and civic needs, in addition to teaching the skills of a trade or craft. Apprenticeship was the chief source of education until the Nineteenth Century. (1, page 21)

Reforms in Education. The Sixteenth Century marked the beginning of the educational reform period. During this period the need for education system was recognized and many theories were advanced as to how the needs of education could be best accomplished. Martin Luther (1483-1546) advanced the theory of state supported education for all people. Luther's idea is expressed in the following statement:

> The right kind of schooling should be given to all the people, noble and common, rich and poor; it was to include all the boys and girls. The state was to use compulsion if necessary. (1, page 31)

Richard Mulcaster (1531-1611) advocated making drawing a fundamental study. The basis is found in his statement, ". . . the hand, the ear, the eye be the greatest instruments whereby the receiving and delivery

of learning is chiefly executed". (1, page 33) Francis Bacon (1561-1626) based education on nature and the arts of daily life. The use of "manual arts" is mentioned in his writings. Ferdinand Kinderman (1740-1801) made industrial work a part of the school. John Henry Pestalozzi (1746-1827) organized hand work as a part of the general school. Phillip Emanuel von Fellenberg (1771-1844) made agriculture and mechanical work the foundation of his teaching. There were many other philosophies advanced on the use of manual instruction in the schools that have played an important part in the establishing of industrial education. The Nineteenth Century began with manual training established as a needed part of education. (1, pages 30-209)

Early American Schools. America has always accepted the principles of education at public expense. The value of handwork has been recognized in the history of American schools. The first industrial schools were established to provide training for orphans and poor children (and later in the reformatories), by teaching a skill that could provide a livelihood in later life. (1, pages 242-249)

Manual Training. Manual training is a term that designates a type of educational handwork that was prominent in schools from 1880 to the early 1900's. The purpose was to develop skill in the use of tools through a series of exercises and experiments. The manual training theory developed from the influences of the Russian system of manual education which used exercises to create skills, and the Swedish sloyd method of producing models. Calvin M. Woodward (1837-1914) was the champion of manual training. Woodward envisioned manual training as a

part of general education, the goal being to give instruction in the "universal tools" through the use of exercises. He did not propose to teach a trade. (2, page 337) The first manual training school was established by Woodward in St. Louis, Missouri, on June 6, 1879. (2, page 347) The Manual Training School of Washington University was to give educational instruction in organized shopwork as well as mathematics, science, drawing, and other necessary education courses. "Dr. C. M. Woodward emphasized the importance of making good workmen as well as educated intellects." (2, page 361)

Manual Arts. The manual arts movement was brought about through criticism of the manual training objectives. No elements of design, usefulness, or student interest were considered in the manual training programs. Arthur W. Richards, in 1902, made this statement,

> The arts of industry furnish a motive thought and answer, as nothing else, the requirements for a basis for the manual work in our schools; because, more adequately than any other division of human activity, they represent that which has been envolved by the joint efforts of brain and hand. (2, page 440)

It was suggested that arts and skills other than wood and metal become part of the manual training program. The principles of design and planning are introduced into manual training, in addition to a wider selection of arts and crafts, to form the manual arts concept of educational handwork in general education.

The term "manual arts" was brought into general use by Charles A. Bennett, Professor of Mechanic Arts, Teachers College, Columbia University, in 1893. The term was used to designate a new building at Teachers College, New York City, the Macy Manual Arts Building. This building was used for instruction in art and manual training. (2, pages 435-445)

Industrial Arts. Certain educational leaders felt that too much emphasis was placed on developing skills through the manual arts programs. The educational content of the course was secondary in their opinion. Charles R. Richards, Director of the Department of Manual Training, Teachers College, Columbia University, suggested in 1904 that the term "industrial arts" be substituted for "manual training". The statement made to this effect appeared in the Manual Training Magazine as follows:

> We are rapidly leaving behind the purely disciplinary thought of manual training. . . .Now we are beginning to see that the scope of this work is nothing short of the elements of the industries fundamental to modern civilization. (2, page 453)

Frederick G. Bonser, Professor of Education at Teachers College, Columbia University, contributed greatly to the use and development of industrial arts. Bonser placed emphasis upon educational content of industrial arts and gave this definition:

> The Industrial Arts are those occupations by which changes are made in form of materials to increase their value for human usage. As a subject for educative purposes, industrial arts is a study of the changes made by man in the forms of materials to increase their value, and of the problem of life related to these changes. (15, page 10)

Industrial arts, as used today, includes all forms of shop work, drawing, and arts taught in the school with the purposes of general education in mind.

Part B

Objectives of Industrial Arts

Industrial arts provides a means for the student to become acquainted with the tools, materials, and processes of industry. Aims or purposes must be established before a course of study can be planned. The objectives

of industrial arts have been established to provide for the most efficient means of meeting the needs of the students.

Purposes of General Education. Industrial arts has been defined as a part of the general education. The objectives of industrial arts must also meet the objectives of general education. Many educators have given objectives for general education and in many cases the only difference was in the statement or inference of the aim. The objectives as set forth in "The Cardinal Principles of Secondary Education" are most often used. They are listed as follows:

1. Health
2. Command of fundamental processes
3. Worthy home membership
4. Vocation
5. Civic education
6. Worthy use of leisure time
7. Ethical character. (19, page 3)

The objectives may be summed up to three general purposes: (1) to transmit a way of life, (2) to improve and reconstruct a way of life; and (3) to meet the needs of the individual. The aims of industrial arts must be directed to this purpose.

Objectives of Industrial Arts. As industrial arts became prominent, new aims were developed. The increasing growth of industry created new arts and skills. The industrial arts program was expanded to include the advances of industry. William E. Warner was responsible for much of the early study devoted to objectives for industrial arts. The objectives listed in Warner's dissertation, "Policies in Industrial Arts Education", published in 1928, are often used as a basis for determining today's objectives. These objectives are:

1. Exploratory or finding values which relate to the detection, discovery, or tryout of interests and aptitudes.
2. General guidance, both educational and vocational, gained through broad contacts and studies of industrial vocations.
3. Household mechanics or the development of handyman abilities about ability to do useful things.
4. Avocational opportunities for the development of hobbies, or a side-line interest.
5. Formation of desirable personal and social habits and insights which will influence conduct.
6. Consumers or utilizers knowledges and appreciations of the products of industry.
7. Development of a degree of skill with tools and in tool or machine processes commensurate with the ability of the pupil and incidental to the completion of a project or activity which seems to have "educational" value.
8. Correlation or integration with other studies and interests both in and out of school.
9. Vocational purposes in the definite preparation for a future industrial vocation. Applicable to from 0 to 16 per cent of the average junior high school group where the occasional boy has to drop out of school. (23, page 21)

Warner's objectives could be considered to present the idealist's point of view. The interpretation could be broad and of a general sense. The specific meaning would depend upon the interpretation by the reader. As the need for improved and more efficient education was felt, the objectives have become more specific. Dr. Louis V. Newkirk, Supervisor of Industrial Arts in the Chicago schools, published a statement of objectives in 1948 in "The Industrial Arts Program". The implications of these objectives are very definite.

1. Develop the ability to plan and complete projects, using a variety of tools and construction materials in a workmanlike manner.
2. Give experience 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 experience that will develop social understanding and the ability to work effectively with others either as a leader or as a member of the group. (23, page 23)

The Oklahoma State Department of Education Bulletin No. 105, Industrial Arts in Oklahoma, lists the objectives of industrial arts in Oklahoma. As this survey was limited to Oklahoma high schools, these objectives will be used in discussing photography and the objectives of industrial arts.

1. Industrial arts is complementary to other school subjects and provides opportunities to apply knowledge learned in other school subjects.
2. Develops an appreciation of applied knowledge and skills.
3. Provides a knowledge of industrial drawing, the language of industry, and methods of expressing ideas by means of drawings.
4. Contributes to later vocational efficiency.
5. Stimulates students' knowledge and appreciation of good design.
6. Instils a satisfaction in personal creative achievement.
7. Develops the ability to analyze a job into its processes and organize them into correct procedure.
8. Contributes to consumer knowledge and induces an appreciation of the value of industrial materials and the need for their conservation.
9. Trains in industrial and home safety (including fire prevention).
10. Acquaints students with industrial information and induces a recognition of the standards of industrial attainment.
11. Develops avocational interests.
12. Trains individuals to be more resourceful in dealing with the material problems of life.
13. Stimulates correct attitudes toward an orderly shop and home and their environment.
14. Aids in making vocational choices.
15. Develops qualities of leadership.
16. Develops cooperative attitudes in work habits.
17. Develops an appreciation of the dignity and importance of the occupation of one's neighbor. (23, page 24)

Aims, goals, or objectives can seldom be attained in full degree. Objectives are established as guides to follow when possible. The needs

of the student and the needs of the community are the factors that determine what purpose industrial arts can serve best. Objectives should be prepared for every class and every course, always keeping in mind the objectives of the school.

Part C

Photography and the Industrial Arts Objectives

Photography or any other subject could be proved to meet the objectives of education by broad interpretation. That is not the intent in this survey. The purpose is to show how photography could meet the objectives of industrial arts and should rightfully belong to this field of education.

Objectives of Photography. Before the objectives of photography could be established, the purpose or function of the class must be stated. Adrian L. TerLouw made the following statement as an introduction in his article "Teaching Photography".

> Some create pictures with their photographic skill; others create photographers. Both tasks are equally fascinating; both challenge anyone devoted to doing a job well. To the photographer, successions of varied scenes and varied subject matter present themselves for interpretation by the pattern of light and shade he captures with his camera. The teacher of photography is confronted with a succession of individuals, each with his own reason for wanting to take up photography, each expecting that the instructor will plan the course so that his own personal ends will be best achieved. (17, page 3367)

TerLouw sees the objective of the teacher as creating photographers. The problem is meeting the demand from the wide variety of students. The high school teacher cannot state the objectives in so simple a manner. The objectives of the school must also be considered. If the school is devoted to vocational education, the photography course must be planned

with this in mind. In most situations, the aims of general education are the prime concern of the school. The photography course is planned to provide exploratory experiences that relate to other class work. The primary aim of the photography course is to provide experiences that reveal the actual processes of making pictures. Knowledge of the camera, film, paper, and chemical processes must be acquired. A reasonable skill in the various operations and processes should be developed through actual experience. The additional objectives of photography must be accomplished through the development of a working knowledge of the photographic processes.

Objectives for a Photography Class. The objectives of a class are directly related to the present and future needs of the students. With this fact in mind, a list of objectives has been prepared for a photography class. The application and interpretation of these objectives can be varied by personal opinion. As the use of photography in schools becomes more common, more definite and set objectives will be established. Past experience with photography students as to their needs and desires is the basis for these objectives.

1. To obtain knowledge of the photographic process.
2. To develop a degree of camera skill.
3. To have an understanding of the processing and printing techniques.
4. To provide a practical application of school learning.
5. To provide opportunity for individual talent.
6. To furnish an opportunity for cooperative work.

7. To form an appreciation of orderly work habits.
8. To form an understanding of danger from unsafe work conditions.
9. To further consumer knowledge.
10. To improve the ability to recognize good work.
11. To create interest in other fields.
12. To show the opportunities for a vocation.
13. To offer a leisure time activity.
14. To serve the needs of the school.
15. To provide opportunity for social cooperation.

To show how each objective can be met, it is necessary to discuss the application made of each objective. A brief statement will present the author's views.

To Obtain Knowledge of the Photographic Processes. The primary purpose of any course is to obtain knowledge of the subject. The uses and applications of photography could provide exploratory experiences in the fields of industry, science, advertising, art, journalism, medicine, and education. The processes of photography offer practical work experiences for the student. A wide variety of general information could be acquired through a study of the photographic processes.

To Develop a Degree of Camera Skills. The camera is the tool of the photographer. A working knowledge of the camera is essential to all photographic processes. A good picture depends upon the skill of the camera operator. A sense of coordination and the ability to think rapidly are developed in learning camera skill. Camera skill is necessary in both personal or vocational uses of photography. Camera skill can prevent the feeling of failure from poor results. The cost of materials

used in all types of photographic work may be decreased by a degree of camera skill.

To Have an Understanding of the Processing and Printing Techniques. An understanding of terms, skills, equipment, and chemicals used in photography can best be obtained by actual use. The students can make use of the principles of chemistry and physics through the various processes. Association of similar processes in printing and reproduction can be demonstrated. The vocational aspect is not to be represented by this objective. The general information will be of value to all students as the evidence of photography may be found everywhere.

To Provide a Practical Application of School Learning. The possibilities for application of school learning through photography is unlimited. The student can put into practice the principles learned in science classes. Mathematics is used in calculating exposures and figuring effective focal lengths and f: stops. Planning subject composition can make use of the principles of art. Skills in crafts can be used in making wanted equipment. The journalism class can teach the news value of pictures. Chemistry can be applied to the preparation of solutions. Cooperation among the teachers would provide an unlimited source of applications for subject matter.

To Provide Opportunity for Individual Talent. The ability to recognize pictorial matter is inherent. Through the manipulative processes of photography, a student could learn as well as develop latent talent. Photography could be the source of self-expression. A feeling of pride and accomplishment in personal effort can be developed. Accomplishment

in one field of interest may lead to improvement in accomplishments in other fields.

To Furnish the Opportunity for Cooperative Work. Many phases of photography require the need of two or more persons. The opportunity to work together to complete an assignment can provide valuable training in cooperation. School publications and yearbooks offer the opportunity for group participation. The more talented student can assist the partner, a process by which both learn.

To Form an Appreciation of Orderly Work Habits. Cleanliness is a prime requirement in photography. Dirty equipment can cause complete failure in some cases. The processes require that precise procedures be followed. The student will soon learn to plan the steps of an assignment and to check the equipment before using it. The elements of planning and proceeding in an orderly manner become habits to those working in photography.

To Form an Understanding of Danger from Unsafe Work Conditions. Safety is a consciousness that should be developed in all students. Photography makes use of electricity in many ways. Here is the opportunity to show the danger of poor connections, dampness near electricity, and expense of damaged equipment through short circuits. Gas is often used as a source of heat. Again the opportunity for safety instruction is presented. The proper storage of chemicals to prevent the danger of fumes and acid burns is necessary. Film spools on the darkroom floor have caused many bad falls. The real danger is from carelessness.

To Further Consumer Knowledge. By stressing the qualities of good construction and usefulness of equipment, the teacher may benefit the student as a consumer. The ability to recognize quality can be valuable in later years.

To Improve the Ability to Recognize Good Work. By practicing photography, the student learns of the skills needed to produce good pictures. The ability to recognize the requirements of good pictures, such as composition, tone value, surface texture, and printing technique, will be gained by the student. An appreciation and respect for the creator of good work will be felt. Respect for achievement of skills in other fields will be developed.

To Create Interest in Other Fields. Many fields of industry and science are represented in photography. As photography is explored, an interest in a related field could develop. This interest might create a desire for knowledge that would cause a better understanding of school work through concentration due to personal interests.

To Show the Opportunities of a Vocation. The uses and applications of photography offer many opportunities for a vocation. The teacher could explain the requirements of the work, the education needed, and salaries and work conditions that could be expected.

To Offer a Leisure Time Activity. Photography is the hobby of many people. The values of pictures of the family, trips, places, pets, and events could be stressed. Photography could become a family activity in the home.

To Serve the Needs of the School. The schools of today make many uses of photography. If the needs of the school are performed as class activities, a source of valuable experiences is available for the student. The photography classes, as part of the school, could perform all the photography needed for educational purposes.

To Provide Opportunity for Social Cooperation. Social activity can be provided by organized camera clubs and through sponsored field trips. Interests other than education can be provided for larger groups by such activities. A common interest can produce group or social cooperation as a means to solve problems or to complete projects. The student, the teacher, and the families can meet on a social level.

The objectives of photography, as given, are not intended to be conclusive. The intent was to present a basis for thought as to what objectives of education can best be met by the photography courses. This is the era of specialization. A skill or knowledge of specific nature is needed to earn a livelihood. The vocational aspects of photography cannot be overlooked.

Photography and the Objectives of Industrial Arts in Oklahoma. As previously stated, the author believes photography can best serve education through the division of industrial arts. Can photography meet the objectives of industrial arts in Oklahoma? This question can be answered by reviewing the objectives and showing how photography could be applied to them. As the purpose of the photography course is not established, the discussion must be of a general view.

1. Industrial Arts is complementary to other school subjects and provides opportunities to apply knowledge learned in other school subjects.

The applications through photography are limited only by the ingenuity of the teacher.

2. Develops an appreciation of applied knowledge and skills.

Photography is composed of many skills and knowledges. An appreciation of photographic knowledge and skill is created if the objectives of photography are met. The consciousness of these elements would be recognized in other work.

3. Provides a knowledge of industrial drawings, the language of industry, and methods of expressing ideas by means of drawing.

Photography could easily become the language of industry. It is a faster and more accurate method of reproduction and gives a better representation. Wide use is being made of photo-templates and printed circuits. Drawing and photography should be studied as a unit and not as opposing methods of representation.

4. Contributes to later vocational efficiency.

Efficiency is due to practice and skill. A study of photography in the school would be of value in many vocations.

5. Stimulates student's knowledge and appreciation of good design.

In the sense of construction, photography could do little for this objective. The subject composition places emphasis upon balance and points of interest. A sense of artistic appreciation is developed through photography.

6. Instils a satisfaction in personal creative achievement.

Every picture printed represents a personal pictorial creation. A good print furnishes a great personal satisfaction or pride.

7. Develops the ability to analyze a job into its processes and organize them into correct procedure.

Photography is a science composed of orderly procedures. Each photograph must be planned before the shot is made. Planning and following procedures is the basis of photographic learning.

8. Contributes to consumer knowledge and induces an appreciation of the value of industrial materials and the need for their conservation.

The scope of this objective is very large. The use of pictures would be important in filling the needs of consumer knowledge and conservation of materials. Construction and design as to usefulness of photographic equipment could be termed "consumer knowledge".

9. Trains in industrial and home safety (including fire prevention).

Safety consciousness is one of the objectives of photography. Photographs of unsafe conditions could be used to further the objective.

10. Acquaints students with industrial information and induces recognition of the standards of industrial attainment.

The use and application of photography would provide information of industrial methods.

11. Develops avocational interests.

Photography has long been ranked as one of the most popular hobbies. Little activity is needed to create avocational interest.

12. Trains individuals to be more resourceful in dealing with the material problems of life.

The photographer often is forced to improvise equipment and materials in order to complete a project.

13. Stimulates correct attitudes toward an orderly shop and home, and their environment.

If the interpretation is made to imply orderliness and neatness, then photography can contribute to the objective. The photographic processes require a clean, orderly arrangement of equipment and materials.

14. Aids in vocational choices.

Opportunities for a vocation are also an objective of photography.

15. Develops qualities of leadership.

Advanced students could function as assistants to the instructor in teaching photography.

16. Develops cooperative attitudes in work habits.

The ability to cooperate is also an objective of photography. Many processes require two or more persons. Students working in pairs can learn together and from each other.

17. Develops an appreciation of the dignity and importance of the occupation of one's neighbors. (23, page 24)

Photography is required by almost all professions and vocations. In studying the uses of photography, the opportunity is presented to observe the workmen of industry, of professions, and other activities. Photography is a developed skill. An appreciation of skill will lead to respect.

It can been seen that the proposed objectives of photography closely proximate the objectives of industrial arts in Oklahoma. Photography can be applied to meet, or aid in meeting, the established objectives of industrial arts. Photography is both an art and an industry. The place in education for photography should be in the industrial arts division. Here, photography can serve both as part of the educational program and as an aid to education by meeting school needs.

The survey of photography classes in the Oklahoma schools is reported in the following chapter. It may be of interest to refer to the objectives of industrial arts as the data are presented.

CHAPTER IV

REPORT OF THE SURVEY

The motivation for this survey was a desire to further the use of photography in the high schools of Oklahoma. The purpose of this survey was to obtain data as to the number of schools offering photography, the courses of study, the equipment used, and the qualifications of the instructors. It is hoped that presented data will be of value to those interested in photography as a part of the general education program.

Part A

Sources of Data

The first problem of the survey was to obtain data concerning the photography classes in the Oklahoma high schools. What information is needed to accummulate sufficient data from which conclusions could be made? What conclusions would be of value to those interested in photography in the Oklahoma high schools? To find real problems or conditions one must be present so as to receive a true picture of the situation. A visit to each high school offering photography seemed to be a logical method of acquiring the needed data. This procedure was adopted as a means of obtaining the majority of the information in this survey.

First Attempt to Locate the Schools Offering Photography. If one was asked how many high schools in Oklahoma were teaching mathematics, the answer would be "all the schools". In the case of photography, this

is not true. The first thought might be that all the larger city school systems would probably teach photography in some form. This was the conclusion formed by the author, but this did not prove to be the correct answer. A search was begun for a listing of subjects taught in the Oklahoma high schools. Such a list was located in the Annual High School Bulletin published by the State Department of Education. In the various issues of this bulletin, photography is listed as a "footnoted" subject. For example, it might be listed in this manner: "Industrial Arts - 2y". This would mean that two units of industrial arts is offered and in addition the "y" would show in the footnote that one unit of photography is offered. Unfortunately, there was a change in the form of the bulletin published in June 1954 and this information is no longer available.

State Department of Education Data. After June 1953, the only source of the required information appeared to be the files in the office of the State Department of Education. Standifer Keas, Assistant Superintendent in Charge of Instruction, was extremely generous with his time and help in locating this data. The only source of this information was found in the "Application for Accreditation" that is filed annually by the Oklahoma high school principals. The location of the schools now teaching, or that were accredited to teach, photography for the school year 1953-54, and the present year, 1954-55, were found by examining each of these applications. This was a rather lengthy task. This method did not prove completely successful as several other schools have been located which offer photography.

This search yielded the name and location of the school, the course or department in which photography appeared, name of the teacher, and the number of units offered. Table I (page 70) lists the schools that were

TABLE I

RESULTS OF THE FIRST ATTEMPT TO LOCATE OKLAHOMA HIGH SCHOOLS OFFERING PHOTOGRAPHY

High School	Location	Years Photography Was Offered and the Number of Accredited Units									
		1945-1946	1946-1947	1947-1948	1948-1949	1949-1950	1950-1951	1951-1952	1952-1953	1953-1954	1954-1955
Midwest City	Midwest City	1	1	1							
Douglass	Bartlesville				1	1		1	1	1	1
Ponca City	Ponca City				½	½	½				
McLish	Fittstown					1	½				
Miami	Miami					½		½	½	½	
Classen	Oklahoma City					1	1	1	1	1	1
Capitol Hill	Oklahoma City						2	1		1	1
Central	Oklahoma City							1	1	2	1
Daniel Webster	Tulsa							1	1	½	2
Douglass	Oklahoma City								1	1	1
Northeast	Oklahoma City								1	1	1
Waynoka	Waynoka								1	1	
Mill Creek	Mill Creek								½		
Jabbok Bible Sch.	Thomas									1	1
John Marshall	Oklahoma City									1	
Okmulgee	Okmulgee									1	
Central	Tulsa									½	½
Cushing	Cushing									½	½
Quapaw	Quapaw									½	
Gate	Gate										½
Lawton	Lawton										½
Totals: 21 schools		1	1	1	2	5	4	6	9	15	12
Number of Accredited High Schools:		848	841	825	826	821	815	809	808	801	801

located through this source of data.

Additional Information Located. The small number of schools offering photography that were located by the first research was very disheartening. A new search was started for additional schools. By interviewing members of the photography classes at Oklahoma Agricultural and Mechanical College, several additional schools were found. Further information was obtained from commuting teachers enrolled in Saturday classes at the College. Discussions with teachers at the district teachers meeting led to location of an additional school. There were several references made to camera clubs at various schools, but as they were not offering a course in photography, these schools were not used as sources of data for this survey. Table II (page 72) names the schools that are used as data sources in this survey.

The Questionnaire. The problem of obtaining data from the high schools offering photography presented difficulties. If detailed and complicated questionnaires were used, the number to respond might be extremely few in this already limited field. The author was most interested in the actual problems involved in teaching photography. This presented the problem of preparing questions that could be answered simply, yet convey information from which to form conclusions that would be of value. Several lists were prepared that contained problems which have occurred in the author's past experience. Discussions with interested persons suggested new problems that might arise in establishing a course of photography in a high school. The questionnaire was prepared so as to request information on general conditions, with space provided to describe special or unusual situations or equipment.

TABLE II

OKLAHOMA HIGH SCHOOLS THAT RECEIVED QUESTIONNAIRES

High School	Location	Years Photography Was Offered and the Number of Accredited Units									
		1945-1946	1946-1947	1947-1948	1948-1949	1949-1950	1950-1951	1951-1952	1952-1953	1953-1954	1954-1955
Midwest City	Midwest City	1	1	1							
Douglass	Bartlesville				1	1		1	1	1	1
Ponca City	Ponca City				½	½	½				
McLish	Fittstown				1	½					
Miami	Miami					½		½	½	½	
Classen	Oklahoma City					1	1	1	1	1	1
Capitol Hill	Oklahoma City						2	1		1	1
Guthrie	Guthrie						½	½	½	½	½
Southeast	Oklahoma City							2	2	2	2
Central	Oklahoma City							1	1	2	1
Daniel Webster	Tulsa							1	1	½	2
Douglass	Oklahoma City								1	1	1
Northeast	Oklahoma City								1	1	1
Waynoka	Waynoka								1	1	
Mill Creek	Mill Creek								½		
Jabbok Bible Sch.	Thomas									1	1
John Marshall	Oklahoma City									1	
Okmulgee	Okmulgee									1	
Central	Tulsa									½	½
Cushing	Cushing									½	
Quapaw	Quapaw									½	
U. S. Grant	Oklahoma City										2
Gate	Gate										½
Lawton	Lawton										½
Totals: 24 schools		1	1	1	2	5	5	8	11	17	15
Number of Accredited High Schools:		848	841	825	826	821	815	809	808	801	801

The Decision to Visit Each School. The possibility of a personal visit to each school had been contemplated in the beginning of this study. The questionnaire revealed situations that could not be adequately discussed by answering questions on paper. For example, how does the teacher feel about his work? What techniques are used in teaching photography? How do the students react to various approaches to photography? The value of this survey to the establishing of photography as a part of the general education program depended upon the presenting of true facts and situations. The personal visitation method was adopted as a definite part of this survey, in hopes that facts could be evaluated better. The questionnaire was modified for the purpose of collecting data that could be discussed at the time of a personal interview. Space was provided to indicate when it would be most convenient for the interview and an opportunity to observe the photography class during a regular period of instruction. A copy of the questionnaire is included in the Appendices.

Distribution of the Questionnaire. The photography teacher would be the person to fill out the questionnaire, but as the problem concerned the school, it was also a matter for the principal. The Oklahoma Educational Directory for 1954-55 provided the names and addresses of the principals of the various high schools to be visited. The questionnaire was sent to the principals of twenty-four high schools in Oklahoma that were indicated as having taught, or as teaching photography. The replies were returned very promptly in most cases.

Visitations. The original plan called for a visit to all schools listed, even if photography had been discontinued. Problems of time and

distance made this procedure impractical. It was decided that only those schools now teaching photography would be visited. Table III (page 75) lists the schools that were visited and presents corrected data obtained during the personal interviews.

Space had been provided in the questionnaire to indicate the most appropriate time for an interview. Again the problems of time and distance made this procedure impractical. A series of trial visits were planned to discover if any particular problems were encountered by unannounced visitors. The three schools chosen for the trial visits provided such a wealth of information that this procedure was followed throughout the visitation period. At this point acknowledgment should be made of the courteous manner in which the teachers handled this situation. A total stranger walked in unannounced to observe the method of teaching and to survey the equipment and facilities. Even so, the author was met with courteous treatment and an apparent interest in the survey. A true picture of the situation was obtained, but this procedure should not be recommended in fairness to all parties concerned.

A statement of the purpose and aims of the survey was discussed at each visitation. The questionnaire was checked and necessary corrections were made. A tour was made of the darkroom with a discussion of the equipment and facilities. The problems peculiar to that particular class were discussed in relation to supplying materials, type of work required of the students, and the photography work done for the school. Many problems were discovered in these discussions that would have remained unknown had it not been for the personal visits.

TABLE III

CORRECTED DATA OBTAINED DURING VISITS TO SCHOOLS

High School	Location	Years Photography Was Offered									
		1945-1946	1946-1947	1947-1948	1948-1949	1949-1950	1950-1951	1951-1952	1952-1953	1953-1954	1954-1955*
Douglass	Bartlesville							X	X	X	2
Miami**	Miami	X	X	X	X	X	X	X	X	X	½
Classen	Oklahoma City					X	X	X	X	X	1
Capitol Hill	Oklahoma City		X	X	X	X	X	X	X	X	2
Central	Oklahoma City						X	X	X	X	2
Guthrie	Guthrie						X	X	X	X	1
Southeast	Oklahoma City							X	X	X	2
Daniel Webster	Tulsa									X	2
Douglass	Oklahoma City								X	X	1
Northeast	Oklahoma City								X	X	2
John Marshall	Oklahoma City						X	X	X	X	2
Okmulgee	Okmulgee						X	X	X	X	1
Central	Tulsa									X	1
Cushing	Cushing									X	½§
U. S. Grant	Oklahoma City										2
Gate**	Gate										1§
Lawton**	Lawton										1
Totals: 17 schools		1	2	2	2	3	7	9	11	14	17
Number of Accredited High Schools:		848	841	825	826	821	815	809	808	801	801

* Number of units offered during school year 1954-55.

** Schools not visited; data obtained from letters.

§ Photography courses offered in alternate years.

Validity of Data. Information obtained from a carefully prepared form would no doubt present data that could be substantiated. In many cases such a form could be prepared where a definite condition existed that would require specific answers. Unforeseen conditions could not be reported accurately unless they were considered at the time the form was prepared. For example, questions were asked, in the questionnaire for this survey, regarding the type, quantity, and ownership of the various equipment the school classes were using in the photography program. The returned questionnaires indicated that in some cases school-owned equipment was in use as well as the instructor's personal equipment. The personal visitation method of obtaining data showed that in some cases equipment, loaned to the photography class by merchants and other interested parties, was not listed although it was being used. Misinterpretation of the question by the person completing the questionnaire was another reason for incorrect data.

As the data for this survey was checked and corrected at the time of each interview, it should present a great degree of accuracy. The validity of the statistical data can thus be established. The interpretation of conditions, problems, and methods, as well as the conclusions, were formed as personal opinions. Their validity will rest in the future.

Part B

Survey Data

The visits to the various high schools brought out many problems common to all schools; namely, the shortage of space, funds, and teachers. As this survey dealt only with the photography classes, no attempt is

made to compare these problems to the general problems of the schools. It was found that there are a few problems common to all photography classes, but in the majority of the cases studied, many problems are peculiar to a particular school.

Reporting the Data. Each school visited seemed to have a definite aim or function for the photography class. This data presented no particular difficulty in reporting. The data concerning space, equipment, methods, and particular problems was found to vary as to the functions of the course. This data was tabulated to form tables concerning the various phases of the investigation.

Number of Schools Teaching Photography. It was not expected that all high schools in Oklahoma would offer photography. Photography cannot be considered as an inexpensive course. The equipment used in photography is specialized and made with a high degree of precision. Good equipment means a considerable investment. A certain amount of space is needed; space that can be darkened and ventilated. Plumbing facilities for hot and cold water, with adequate drainage, are needed. These requirements are not met favorably by the school that is crowded and operating on an extremely limited budget. Photography, therefore, could be offered successfully only by a school that could absorb the initial cost of the program. A logical thought would be that such requirements could be met only by the schools in the larger cities or in wealthy areas. The survey shows that to a great extent this assumption is true. An interesting situation is found in the number of smaller schools that have offered photography. The schools are listed in Table II (page 72). The interest

in photography has grown, yet today only seventeen schools from a possible 801 accredited high schools offer photography, or only 2.1 per cent.

Several factors should be considered in discussing the number of schools offering photography in Oklahoma. First, the problems of space and expense as listed above. Second, the problem of locating an adequately trained teacher. Only one school, at the present, employs a full-time teacher for photography. The teacher employed for photography in most schools must also be qualified to fill other vacancies. Third, although the first and second requirements can be accomplished, unless the school administrators feel a need for photography, the program cannot materialize. Photography must be "sold" to the school administrators. Proving the value of photography to the school, and consequently to education, is one of the major obstacles in the growth of photography in the schools. Fourth, the history of photography is young. The first workable process was discovered in 1839; the first practical process appeared in the 1890's. Photography is not instilled in education as are the three "R's". Photography can become an interest, a vocation, or a profession. It can be taught as an art, a science, an interest, or a vocation. Yet its value to general education must be proven before the schools can offer photography.

Table IV may be of interest as it gives an indication of the number of people who will be employed as photographers. This table does not list the many persons employed in related fields dependent upon photography. (See page 79 for Table IV.)

Photography in the Oklahoma high schools is a new development. It is too early to make conclusions as to the success of this course. The

growth of this development is indicated in the survey. One aim of this survey is to create an interest in photography as a part of the general education program through its application as a division of the industrial arts program.

TABLE IV

THE GROWTH OF PHOTOGRAPHY AS A PROFESSION*

Year	Total Population	Number of Photographers
1840	17,069,453	0
1850	23,191,876	938
1860	31,000,000	3,154
1870	39,000,000	7,558
1880	50,000,000	9,990
1890	63,000,000	20,040
1900	76,000,000	27,029
1910	92,000,000	31,775
1920	106,000,000	34,259
1930	123,000,000	39,529
1940**	131,669,275	33,701
1950**	150,679,361	52,489

*Data from 1840 through 1930 taken from Photography and the American Scene, as listed in the U.S. Decennial Census Report (16, page 61).
**Data for 1940 and 1950 from the U.S. Decennial Census Report.

The Teachers. One of the most interesting phases of the survey was the opportunity to meet the photography teachers. What caused them to enter the field of teaching photography? What type of training and background did they have? How did they cope with the problems of space and finances? These, and many other questions, were answered at the interviews. The variety of experiences in training and background of the teachers had a definite influence on their teaching. It should be understood that no criticism is being made of any teacher or his training. Only in the interest of furthering photography in education is their

previous training considered. The results of their teaching can help determine what training is needed by the new teacher of photography in order to make his efforts successful. In all but one case, the teacher employed for photography is also teaching at least one other subject or performing other school duties. Certification policies are the source of this problem. There is no certificate issued for photography. Therefore, it is necessary for the teacher to be certified in related fields. Information obtained by discussion with the teachers indicated that apparently only two had planned to teach photography and took preparatory work in this field. The majority of the teachers had an interest in photography that eventually led to their teaching a class in this subject. There were a few who indicated they were drafted for the job, but later developed an interest in the work. Six of the seventeen teachers have had professional experience. Naturally they incorporate their professional training in their teaching program. In three cases, the teacher is using photography as an application of another field. There are, no doubt, several schools that are offering photography in this sense that were not located. Photography could be a unit of chemistry, physics, graphic arts, art, or journalism. As this would not be indicated on the "Application for Accreditation", there was no practical means of locating these schools.

As was stated earlier, only one school employs a full-time photography teacher. This implies that the remaining photography teachers must also fulfill other school obligations. Table V (page 81) lists the other duties performed by the teacher in addition to teaching photography, and the photographic training or experience of the teachers who

TABLE V

TYPE OF PHOTOGRAPHIC EXPERIENCE AND
OTHER DUTIES PERFORMED BY TEACHERS

Type of Photographic Experience				Other Duties Performed
College	Professional School	Professional Experience	Hobby	
		X		Art
			X	Audio-Visual
X				Audio-Visual director
X		X		Audio-Visual library and typing
X	X			Guidance
	X	X		Industrial arts
X				Industrial arts
X				Industrial arts
	X			Industrial arts
	X	X		Industrial arts
	X	X		Industrial arts
X				Journalism and administration
	X			Physics and chemistry
			X	Principal
		X		Public relations
X				Science
X	X			Science and math.
8	7	6	2	Total: 17 teachers

are now engaged in teaching photography in Oklahoma. The one full-time photography teacher is listed in this table under "Industrial Arts" as this is the department to which he belongs.

To simplify this data, the following terms were used as designated. "College" implies that academic training was experience at a college or university in photography courses. "Professional School" means training was completed at an established commercial photography school. "Professional Experience" implies that at one time the teacher earned his income through some form of commercial photography. "Hobby" means the only experience in photography has been as a personal interest. "Other Duties Performed" means the manner in which the remainder of the teacher's time is employed at the school, with the exception of the one full-time teacher.

There are three exceptions which were handled in this manner. Two of the teachers received their training through military service schools. They are listed under both professional school and professional service. One teacher is receiving training through an adult education night school. This also has been listed as professional school as the work is of a vocational nature.

The Function of Photography in the School. Of what value is photography to education? This should be the major concern of a school staff planning to offer this course. The value might be of a general education nature; in this case photography could serve as a means of practical application of other courses. Considering the schools investigated in this study, it was found that there are a variety of functions served by the photography courses. The primary purpose of photography in the school should be a means to increase the area of general education experiences.

Photography can also serve the school in other capacities. The administration of the school could be aided through pictures for public relations work. Identification photographs could be made of the students for the permanent record file. School activities, such as sports events, dances, and school plays, could be photographed to record these events. Visual aids could be prepared for other teachers in the way of photographs or film strips. The field of vocational education can also be served by photography. The teacher's background is one of the influencing factors as to the function or purpose of the photography class. The function of photography can be varied to fit the needs of the individual schools.

Unfavorable Comments on the Photography Programs in the Oklahoma Schools. Photography serves the schools of Oklahoma in a variety of ways. The school annual provides the photographic interest in the majority of the schools. Materials for this work are furnished by the school and the photography class donates its time to the preparation of the photographs that are required for the annual. These same photographs are often used in the school paper or for public relations work. An unfavorable remark was made by a merchant in regard to this use of photography. It was implied that the school was only interested in obtaining a free service that otherwise would be performed by professional photographers, who help the schools by paying taxes. No doubt there are others who have this feeling. However, this attitude could be felt towards any industrial or vocational program. Whenever possible, the subject of photography as a high school course was discussed with merchants, distributors, photographers, and other interested persons. This particular situation was mentioned only twice. The majority of discussions revealed a great

interest in the field of photographic education and a wish for its success.

Industrial Arts. The graphic arts division of the industrial arts program is making use of photography. Units in mechanical drawing, printing, and photography are offered by several schools. These courses involve the principles of pictorial representation and reproduction. The student becomes acquainted with industrial and professional methods of reproduction that are used today. Natural talent or skill can be developed through a program of this type. The various manipulative phases of these courses can help develop an understanding of these processes in the less talented student. Photography also offers an opportunity for the girl students to participate in the industrial arts program. The author believes the industrial arts department to be the ideal location for photography courses. In this capacity, photography can serve all the interested students and better serve the needs of the school.

Science. Photography is a complicated science. The fundamentals of chemistry and physics form the basis of photography. The physics, chemistry, and science teacher can make use of photography as a means of applying fundamental principles. This might be termed as an "academic" application of photography. Experiments could be made that might create interest in the basic course. The student would have a means of practical application of the principles of chemistry and physics. A photography course of this type would be limited as to function. The principle objective would be to act as a teaching aid. The activity of the class would be confined primarily to applications of the basic subject. Personal interest of the student could not be developed in this

program. Photography is used in this manner in some of the Oklahoma high schools. The use of photography as an integral part of a course should be recommended; however, its use should not be limited to this application.

Journalism. Teachers of journalism courses are also making use of photography. Today, journalism without photography would be of limited value. The number of students is extremely limited in this use of photography. Emphasis is placed on pictures with news value or pictures that tell a story. The fundamentals of photography are secondary to the purposes of journalism in this course. Only those students selected by the teacher for their ability or talent are offered the opportunity of photography. This type of program might be classified as a school function. The school paper or annual would receive the benefits of this class. Public relations material for the school could also be prepared by this class. The training would be of great value to those students planning to enter the field of journalism. Schools were found that offer only this type program. Other schools had similar programs in which the photography classes cooperated with the journalism classes to broaden this phase of education.

Visual Education. Another program was found in which the journalism class and the photography class were cooperating in the use of audio-visual materials. Photography is taught with emphasis of its value to the field of visual education. Filmstrips are available for the students that show the various processes of photography. The student learns the value of this method of education by actual use. This phase of photography

can be of great value to the school. This use would be limited by the equipment that is needed to successfully carry out such a program.

Vocational Education. There is only one subsidized vocational education course offered in photography in Oklahoma high schools. Other schools indicated that their programs might be considered vocational. This assumption is probably made on the basis of the nature of work that is offered in the photography class. There are probably schools which were not located that are offering "on-the-job" training in photography. Vocational photography has a definite aim which is to produce photographers. This program might be considered as pure or practical photography. Emphasis would be placed on learning how to do a job correctly by developing skills. Vocational programs require the use of professional equipment. The cost of obtaining adequate equipment must be considered if this program is planned. The study plan for this class could be arranged to meet any photographic need of the school. Limited amounts of commercial work could be undertaken. Arranging practical work for the students presents a unique problem. The instructor must be careful not to compete with the local photographers. The schools should not be in competition with free enterprise.

When one considers the data in Table IV (page 79) as to the number of persons employed as photographers and estimates the number of persons required by related fields, the value and possibilities of a vocational education program in photography can be seen readily.

Hobby or Interest. Today, it is possible for anyone to take pictures. New and simple processes have made photography America's number

one hobby. The previous discussions have shown how photography is used in education to fill academic and vocational needs. What of the many students who are interested only in taking pictures for their own use? The schools can provide education for this group in several ways. A basic or simple photography course could be offered. This course would deal only with the problems and processes needed by the average person who is interested in obtaining good pictures. Some schools indicated programs of this type were in progress. The camera club can also be used to serve the need of this group. A majority of the instructors are in favor of camera clubs, but prefer not to sponsor this club. The preparation of materials and programs for the club is very time consuming. Darkroom facilities will become a problem. There are many such problems concerning the camera club that require the patience and concentrated effort of the sponsor. A well-planned program for a camera club could create a desirable education program as well as satisfy the interest of the group. Some schools offer night classes in photography through the adult education program. Programs of this type can be varied to meet the needs and interests of the class.

The photography programs offered by the Oklahoma high schools are varied as to the need of the school. Personal influence of the instructor or administrator has much influence on the type of program offered. Whatever the program may be, a school need is being filled by photography. The limits of general education have been broadened.

Table VI (page 88) shows the number of photography classes, the departments, and the number of camera clubs in the Oklahoma high schools.

Types of School Work Done by the Photography Class. If a school offers photography, it could be expected that the photography department would be called on to do any photographic work that was needed. School

TABLE VI

PHOTOGRAPHY CLASS LOCATION AND NUMBER OF CAMERA CLUBS

Department	Frequency	Number with Camera Clubs
Journalism	2	1
Science	3	1
Industrial Arts	8	5
Audio-Visual	1	1
Independent	3	1
Total	17	9

annuals or yearbooks are the most common form of school photography work. In one case, the photography instructor uses the annual as the objective of his course. School events, sports, and campus scenes are the most common photographs made for this purpose. Individual pictures are not generally made as it would involve retouching and mass production techniques. Most schools are not equipped to handle this volume of work. The journalism class was mentioned very often as cooperating with the photography class in this venture. Record shots of sports events and school activities are sometimes made that are not intended for yearbook work. The school newspaper is supplied with prints as they are needed. Visitors to the school are photographed for records and news publications.

Identification photographs of students for permanent record purposes is another service offered. Public relations photographs are made as needed.

Photographs are made for teachers to use as teaching aids. Filmstrips are prepared to show steps or operations in a process. In a few cases motion pictures are made of special events which are later shown to the students and then filed as records. Photographic reproductions

TABLE VII

TYPES OF PHOTOGRAPHIC SCHOOL WORK AND NUMBER OF SCHOOLS INVOLVED

Type of Work for School	Number Doing Work	Number Not Doing Work
Annual or Yearbook	13	4
Public Relations	6	11
Identification	2	15
School Activities	8	9
Film Strips	1	16
Motion Pictures	2	15
Group Pictures	4	13
School Paper	6	11
School Work of Any Type	14	3
Total Number of Classes = 167		

are made and the size of the original is increased or decreased as needed. All these applications were displayed by the various schools during the interviews. The teachers accept the fact that the job is to be done and see that it is completed. The author received a copy of one school paper that was completely produced by the students. Not only were the photographs made by students, but the plates from which they were printed were also made by students. The photography classes are serving these schools well by meeting their needs. The returned questionnaires did not describe adequately the work done for the school. Table VII shows the

number of schools engaged in the different forms of school work by photography classes as indicated by the questionnaire the the interviews.

The Space Problem. Space, for any purpose, is a major problem in the schools today. Photography classes are also facing this problem. Floor space alone does not satisfy their need. In addition to floor space, plumbing facilities must be available, ventilation must be considered, storage space is needed, and a work area must be planned. It is easy to visualize the many problems that are involved in planning the space needed for a photography class. The older schools have made use of any available space. Closets, washrooms, storage rooms, and in one case, a nursery have been converted to provide darkrooms for photography classes. The new schools have been designed with provisions for darkrooms. The fourteen schools offering photography which were visited were making good use of their space. They are all crowded or perhaps "cramped" would better describe the conditions. Only one school might be said to have adequate space for the photography program. In this case, the space has been divided and designed to permit the maximum number of activities to be carried on. In some cases one would not believe that a photography program could be taught in so small a number of square feet of floor space. The teachers are to be commended for their efforts to solve this problem.

The question that might be asked now is difficult to answer. How much space is needed to teach photography? The answer is based on many variables pertaining to the number of students, the type of course offered, and the future plans for the course. The older schools have one advantage. Since their space was acquired, not designed, it quite often

consists of two small rooms instead of one large room. A film room and a printing room can be constructed in this space arrangement. This permits two operations, developing and printing, to be carried on simultaneously. The new schools have been designed with provisions for a darkroom. Printing, developing and storage are confined to one room in most cases. The activity of the class is limited by this condition. Two conditions were very prevalent in the schools that were visited. First, the space was given to photography but very little work was done to make the space usable. Second, the space was given to photography, very well-constructed and finished, but of poor design for a photography class. One reason for these conditions might be traced to the changing of the teacher. One teacher designs and plans; the new teacher attempts to use space not knowing why it was so designed. The photographic background of the instructor may influence the design of darkroom space. It is very easy to teach as you have been taught. Lack of experience in photography on the part of the teacher could also be a source of inadequate planning. The failure of the school administration to make proper inquiries as to the needs before making decisions could be another reason for the poor design of facilities.

The schools, the administration, and the teacher are not to be criticized. They have a job to do, a limited budget, a shortage of space, and too many students. The ideal conditions seldom exist. The majority of the teachers are probably satisfied with their space as they realize there is little chance to obtain more. Three schools mentioned plans to remodel and increase the space and facilities available for photography.

Needed Space. There are a number of steps or processes envolved in making pictures. Each process requires certain facilities. The film must be processed, so a film or developing room is needed. This room does not need to be large, but should have two counters, one for dry work and one for wet work. It should also be provided with running water. After processing, the film is printed. A larger room is now needed. A table or counter is needed for the enlargers, printers, paper cutters, and materials. A large sink or water-proofed counter is needed for the chemical trays. Hot and cold water should be plumbed to the sink. The final step is finishing. A work area is needed with a table and sink for washing and a table for drying and trimming. These operations listed above could be performed in a single room, but the activity of the class would be limited. Some space should be available for the making of pictures. This area should be large enough to allow for proper lighting and arranging of the subjects. Storage of materials and equipment must be considered. This space is generally provided by cabinets beneath the darkroom counters. If proper consideration is given to the placing of the cabinets, the space can be well used. Storage space outside of the darkroom would be more satisfactory and provide better conditions for storage. The actual space demanded could be determined only after careful consideration was given to the type of program planned and the number of students engaged in this activity.

Ventilation. Few dark rooms are adequately ventilated. In a short time they become damp, mouldy, and develop a bad odor. An ideal situation would make use of air conditioning. An exhaust fan is the common solution. If an adequate volume of air is moved, the ventilation problem

does not become critical. Some means should be made to "air" the darkroom occasionally. The location of the darkroom does not make this possible in most cases. Light traps should be recommended whenever possible as they allow a greater flow of air. A door could be placed at the entrance to provide a means of locking the darkroom. The majority of schools have recognized this problem and only in a few cases is ventilation a major problem.

Electrical Facilities. Electricity is a need that cannot be overlooked. A sufficient amount of outlets that are well protected from dampness should be planned for every darkroom. Two schools could be said to have safe and sufficient wiring systems in the darkrooms. Other schools had good installations, but they were inadequate or poorly planned. Some darkrooms did not have a means for providing white lights, and only the safe lights were used for illumination. This would make cleaning very difficult. Extension cords were a common sight. In the interest of safety on the part of the student and the instructor, the author could not approve, in any sense, some of the wiring and lighting arrangements that were noted. Students are forgetful; their hands are often wet or damp. This should be remembered when planning an adequate wiring and lighting system. Blown fuses are a common occurance to the photographer. The photo-flood lights, dryers, mounting press, and printing equipment very often cause an overload. A good plan would call for a master meter switch and sufficient circuits to carry any normal load. Switches should be located in a convenient place away from moisture. If pull chain switches are used, some measure should be taken to see that they are properly insulated.

Water and Sewers. Photographic processes demand a supply of both hot and cold water. Where there is water there must be a sewer for disposal of the water. This need has created many problems. One school was required to raise the floor in the darkroom so as to be above the sewer. Another class did not have water available until a demand was made for drinking water which caused a water fountain to be installed in the hall, and then water was plumbed to the darkroom. The need for water and sewer facilities should be given consideration when planning a darkroom. This necessity for water can make some available spaces useless for photography.

There are many requirements that must be considered in planning the darkroom. Careful consideration and advice from qualified persons can aid in planning the area to be devoted to photography so as to obtain maximum utilization. The value of the program to the school and to the student can be increased by well-designed facilities.

School-owned Equipment. Photographic equipment is a problem of great concern. Ruggedness and precision are not qualities usually associated. Photographic equipment is designed to work with a great degree of accuracy. It must operate smoothly and rapidly, but still maintain its accuracy. This equipment is to be subjected to one of the most difficult uses -- student use. A large manufacturer of tools produces a line designed for school shops called "Boy Proof", designating that it is practically indestructable. There is no photographic equipment so designed. The author was very interested to learn the reasons certain equipment was purchased and what equipment stood the usage test. The various teachers suggested that the strongest constructed equipment of

good quality be purchased. Others said to buy the best and teach the students the proper use of the equipment. This would certainly be the proper method, but the budget will not always permit this action. As a general policy, the schools buy on bids. Certain specifications are sent out and the lowest bid is accepted. In other situations, the board of education designates the equipment. Very rarely does the teacher have the privilege of purchasing the equipment that is desired. Other cases were answered by saying the equipment was there when the teacher was employed. Thus little information was found as to why that specific equipment was purchased. It was found that a wide variety of equipment is in use that ranges from the most modern professional equipment to the most inexpensive amateur equipment. The purchase of equipment could be handled most satisfactorily by the teacher, if he is sincere in presenting his needs to the administration. Some teachers were greatly concerned with this problem. Lack of equipment is hampering the development of efficient programs.

Cameras. Cameras probably represent the school's largest investment in photographic equipment. The objectives of the photography class should be the basis for choosing the cameras. It is very easy for the instructor to ask for the camera he personally desires. It was found that few instructors were privileged to designate the camera to be used. Again the problem of equipment abuse should be considered. It should be remembered that no camera is better than its lens. Well constructed and versatile cameras can best fill this need. The $2\frac{1}{4}$" x $3\frac{1}{4}$" press-type cameras are in the widest use and seem to satisfy every need of the class.

They are small, compact, verstile, and inexpensive to operate. The range of cameras in use extends from professional quality to the simple box camera. The difficulties lie in the lack of cameras which again limits the activities of the class. In the interest of showing the ingenuity required of the teacher and presenting material of value to persons interested in establishing new courses, a table was prepared showing the number of students currently enrolled and the school-owned cameras available for their use. Occasionally the teacher had made his personal camera available. This also is shown in Table VIII (page 97).

The teachers, in some cases, are almost doing the impossible by teaching photography with so few cameras. The data in Table VIII will cause many interested persons to devote thought to this condition. If the total number of cameras and students are used, the ratio of students per camera is ten students for each camera. The classes usually meet one hour per day, which means that the average student use of a camera will be less than thirty minutes a week. This is not true in all cases, but is a figure received by dividing the total number of students (475), by the total number of available cameras (46). The teachers deserve credit for this accomplishment. The question is, "What type of program could be accomplished if adequate cameras were available?"

Contact Printers. Contact printing is the simplest means to produce a picture. This process requires very little skill or knowledge. Its value in teaching lies in the fact that the student can make a print very quickly. A contact printer is primarily a box with a glass top and an enclosed light source. A printer can be produced to sell at a low price, but still be able to satisfy all the needs. Time is the only

TABLE VIII

DISTRIBUTION OF SCHOOL-OWNED CAMERAS AND THE NUMBER OF STUDENTS USING THE CAMERAS

Number of Students	Types of Cameras											
							Press			View		Teacher-Owned Cameras
	Box	Folding	35 mm.	Graflex	Reflex	Movie	$2\frac{1}{4}$x$3\frac{1}{4}$	$3\frac{1}{4}$x$4\frac{1}{4}$	4x5	4x5	5x7	
5			1			1			1			
5									1			
8							2					35 mm.
9									1			
10		School owns no cameras										
15							1			1	1	
18				1 $3\frac{1}{4}$x$4\frac{1}{4}$	1		1					
18	1		1									$2\frac{1}{4}$x$3\frac{1}{4}$ Press and Reflex
20		1										
21				1 $2\frac{1}{4}$x$3\frac{1}{4}$			2					
25							1					4x5 Press
25				1 4x5		1		1				
30							2					
31							2					
57			1			1	2	1	3		2	
85							2		1			
93									1	1		
Totals:												
475	1	1	3	3	1	3	15	2	8	2	3	4

Total number of students = 475
Total number of cameras = 46

variable with this type printer. Professional printers are elaborate in design. Instead of one or two lights, a professional contact printer may contain ten, twenty, or more lights that are individually controlled. Contact printers of this type require skill in operating. A means of light control as well as time control is possible with this type printer. The cost of the professional contact printers is prohibitive for school use except in rare cases. The majority of the schools visited have sufficient contact printers. This condition may be due to the small cost of the printers. There is an extremely wide variety of contact printers in use. No particular value could be gained by listing the kinds of printers. Table IX shows the number of contact printers found in the various schools. In this table the contact printers are divided into two groups as being of amateur or professional quality. This does not imply the cost but the limits of the work possible with these printers.

TABLE IX

DISTRIBUTION OF CONTACT PRINTERS

Number of Schools	Types of Printers		
	Amateur	Professional	
6	1		
8	2		
1	3		
1	1	1	
1		2	
17	26	3	Totals

Enlargers. The enlarger or projection printer provides many controls in photographic printing. Not only can the picture be made any desired size, but it can also be improved by the various printing techniques of dodging, vignetting, framing, and by the wide variety of paper surfaces that are available. The printing skill is learned from the projection printing process. Contract printing is a rapid process requiring little skill; enlarging is a relatively slow process requiring considerable skill. A photography class needs a sufficient number of enlargers to permit the students to acquire a degree of skill in the operating and printing techniques. All the schools visited could use more enlargers. It was noted that the enlargers in use were mainly of two types. One type is of amateur quality and inexpensive, and the other type is a professional-quality enlarger of considerable value.

The majority of the schools use the 4" x 5" enlarger. One school owns a 4" x 5" camera yet has only a 2¼" x 3¼" enlarger. The schools owning 5" x 7" cameras have only 4" x 5" enlargers. This cannot be said to indicate poor planning because new equipment could have been acquired when funds were available, and further replacements may be planned. Consideration should be given to the future plans for the photography course before a decision is made on enlargers. The photography teacher is often faced with this problem. For an enlarger to be versatile and capable of handling a range of film sizes, a supplement of lens and negative holders are needed. Here is an added expense that is difficult to explain to the administration. For example, the 2¼" x 3¼" enlarger can accommodate the following film sizes: 35 mm., 828, 127, 120, and 620, or in simple terms, any negative size from 35 mm. to 2¼" x 3¼".

To do this properly means that a 2", 3", and 4" focal length lens should be available and at least three sizes of negative holders. If the objectives of the course can be standardized for one film size, this problem could be overcome. Very few, if any, schools are fortunate in this respect.

The opinion of all the teachers indicated that better service could be expected from the better quality enlargers. The data concerning enlargers as to service and desirability was not sufficient to make conclusions. If the opinions of the teachers are used as a basis, it could be said that a 4" x 5" well-constructed enlarger could best serve the needs of the photography class. If a course is standardized for a certain size film, this fact should determine the size of the enlarger. In many cases the school purchased the best of cameras and the least expensive enlargers. If the photography class is required to do professional type work for the school, it should be supplied with the proper type of equipment. The author's experience has shown that inexpensive enlargers

TABLE X

DISTRIBUTION OF ENLARGERS

Number of Schools	Number of Enlargers	
	Sizes: $2\frac{1}{4}$"x$3\frac{1}{4}$"	4"x5"
3	1	
3	2	
1	3	
1	1	1
1	1	2
7		1
1		3
Total 17	14	13

of poor construction can be a constant source of trouble. It would be

recommended that advice be sought from other schools, from distributors, and professional photographers before purchasing enlargers for student use. The distribution of enlargers in the various schools is shown in Table X (page 100).

Developing Equipment. Developing equipment can consist of almost any type of container that will not react with chemicals. There are several methods of processing film: the tray method, open tanks, and the daylight tank. Each method requires certain containers and film holding devices. The tray method requires only three containers of sufficient size to accommodate the film. Cardboard milk bottles have been cut to size and used. Any glass, enamel, hard rubber, stainless steel or some plastic containers may be used. A darkroom is required for this process. The open tank method also requires a darkroom and is very similar to the tray method except that film hangers or reels are used to hold the film during the process. The daylight tank method implies that the film is developed in daylight. In a sense this is true, as the film is loaded into a light-proof container and the processing is performed in daylight. The chemicals are changed through a light-proof opening in the lid of the tank.

The Oklahoma schools are using all three methods for processing film. The majority of the schools use open tanks and hangers. The type of work required of the students determines the process to be used. Developing equipment is not a problem of great concern as no large investment is needed. The teacher could acquire extra processing equipment as the need is noted. Stainless steel and hard rubber equipment would be the first choice in terms of lasting quality due to breakage.

A variety of processing methods would provide a wider learning experience for the student.

Washing Equipment. The equipment needed to wash film and prints is of minor importance. Washing is basically a process of dilution. The chemicals are washed from the materials and carried away in the overflow. It is necessary to have a flow of water and some means to agitate the prints. Some schools were making use of tray siphons. Others had made washers of their own design. Some had inexpensive commercial washers. One had a very fine professional washer. The type of washer to use would depend upon the volume and type of work being performed. The problem of most concern was not the washing equipment, but the lack of water outlets and drains. The washing process is performed in many of the darkrooms. It would be preferable to have this operation performed in an outside work area. There is always a danger of overflow due to clogged drains. A flood of water in the darkroom could cause serious complications. This danger would be lessened if the washing process was performed outside the darkroom.

Dryers. Drying equipment is always a source of trouble. The function of a dryer is to dry prints rapidly and in some cases to produce a glossy surface. Ferrotype plates can be used if the time element is not critical. A source of heat can be used to speed the drying of the prints on ferrotype plates. The simple electric dryer consists of a curved metal surface, a heating element, and a cover. The ferrotype plate is placed on the dryer and covered. Other dryers are built with a glossing surface and prints are put directly on the dryers. The

fastest drying is from gas-heated dryers. This type of print dryer is expensive and also dangerous if not operated properly. One school is fortunate in having a professional electric dryer that can handle the drying problem in a matter of minutes. The remaining schools are using ferrotype plates and small electric dryers. Print drying was a problem mentioned often by teachers. The surface of the ferrotype or glossing surface is useless if it is scratched. One school, not covered by this report, had a dryer damaged to the extent of $240.00 by carelessness on the part of a student. Drying equipment is either extremely expensive or moderately priced. Unfortunately there is no quality dryer that offers the advantages of professional equipment at a price the schools can afford. This problem might be solved by the purchase of two good drying elements and replacing ferrotype plates as needed. In terms of cost to the schools, dryer and plates range from $10 to $50 and professional dryers from $200 to $400. Most dryers are operated by electricity and the safe use of the dryer should be stressed. The teacher should watch for bad connections and frayed cords. Care should be taken to keep wet materials from coming in contact with electrical connections. Lectures should be given on the care, use, and storage of ferrotype plates and glossing surfaces. The poor results obtained from scratched plates should be emphasized. Film drying was not mentioned as a common difficulty.

Miscellaneous Equipment. Several pages would be necessary if all the photographic equipment was discussed individually. The equipment that has been discussed is necessary in general photography and comprises the greatest expense to the school. The schools which require some

particular work have obtained the necessary equipment. Several schools own strobe light units that are used to photograph school activities. All the schools have some form of flood lights for illumination. Tripods and exposure meters are generally listed under school equipment. Some schools make use of dry mounting and have dry mounting presses. The schools that make film strips have special equipment for this purpose. One class makes group photographs and a platform was constructed to aid in posing the groups. Display racks were noted in several schools that provided a means of giving credit for good work. Reference books and textbooks might also be listed as equipment.

The Oklahoma schools have a large investment in photographic equipment. As new equipment is added, the programs can expand and be of greater value to the student and to the school. The teachers have difficulties due to the lack of equipment, but they overcome this condition to some extent by planning their work in advance to make the best use of available equipment.

Fees. The materials used in the process of instruction, such as film, paper, and chemicals, must be replaced. In addition to materials, it is necessary to make occasional equipment repairs. Some source of funds must be made available for these necessary expenses. A fee could be charged for this purpose, and in most cases this is the policy. The fee situation needs close examination. It was found that fees charged in most cases did not cover the cost of the materials. The average fee is about $1.00, although one school charged a fee of $5.00. Some schools charge no fee as only class work is performed in the photography laboratory. In other schools, teachers try to arrange their projects to fit

the fee. A few teachers reported that many students could not afford an additional fee. These teachers had made arrangements to furnish the materials for those students. The practical solution would be to require the students to furnish all materials with the exception of the chemicals. The difficulty encountered by this plan was finding a means to encourage the student to bring the materials to class. The general practice has been to furnish all the materials needed for the class work. An understanding of this condition by the administrator can help the photography teacher solve this problem. A study could be made to estimate the operational cost and a fee could be decided upon after examining the data. Table XI (page 106) was prepared from the reported data on fees for the last scheduled class. This data could be used in estimating the fee for a new course.

Teaching Procedures. It was interesting to note the different approaches to teaching photography. The programs varied from what may be called a practical work method to formally outlined instruction sheets. Very few courses are actually taught in the hobby sense.

The program that is primarily concerned with production of school materials devotes very little time to theory. The emphasis is on the various processes. This program provides a wide experience in photographing different types of subjects. Much time is devoted to darkroom processes. A program of this type could be considered of most value in a vocational sense. The number of students is limited by the amount of work to be done. This program provides valuable experience for the student, but its value to a general education program is questionable.

A group of teachers in one school system prepared a set of instruction sheets and tests to aid in teaching photography. Here is found an ideal teaching situation. The student has the instruction sheet that informs him of the assignment, the written text to review, and a list

TABLE XI

FEES CHARGED PHOTOGRAPHY STUDENTS FOR MATERIALS USED IN ASSIGNMENTS

Number of Students	Materials Furnished			Amount of Fee
	Film	Paper	Chemicals	
5			x	$ .55
5	x	x	x	none
8			x	.50
9	x	x	x	1.50
10		x	x	none
15	x	x	x	5.00
18				1.00
18			x	1.00
20		x	x	2.50
21				none
25				none
25		x	x	1.00
30	x	x	x	none
31			x	2.00
57	x	x	x	1.80
85	x	x	x	1.00
93	x	x	x	1.00
Totals:				
17	7	10	14	

of operations necessary to complete the assignment. The teacher can act as an advisor when problems occur. His time can be divided among the class members. An instructor in another school had independently prepared a series of instruction sheets similar to those above. Better use can be made of the equipment with this type of program. The instructor knows in advance what material and equipment will be needed for each class period.

Other classes were taught with reference to the teachers study plan. Some time is devoted to theory and discussion of assignments. The remaining time is spent preparing the assignment. The interest of the class is used in suggesting the subject of the various assignments and discussions.

The short time that could be spent with each teacher did not permit an extended survey of the teaching practices. The classes were all engaged in some form of work which would indicate that the teacher had made ample assignments to which their time could be devoted. Reference was made to the lack of available textbooks. This situation is due to the rapid growth of photography. A textbook is obsolete by the time it is published. The instruction sheet can relieve this situation for the student, but it requires more work for the instructor.

Types of Photography Taught. The author was impressed by the types of photography found in the high schools in Oklahoma. One class was making portraits which were later tinted in oils. Copy or reproduction work was a common assignment. The results were equal to many professional jobs. The detail and lighting arrangements in the exhibited still life pictures would make anyone proud to have claimed them. The sports and activity pictures were worthy of publication. Process shots showing detailed operations were made for other teachers to use as teaching aids. Every phase of commercial photography was represented in the class work.

The evidence exhibited was sufficient to show that any phase of photography could be taught in the high school. The only limits to the extent of class application of photography, apparently, is time and

equipment. The photography experience of the teacher is very evident in the students' work. Those with professional training expect professional results. The teachers whose training consisted of hobby or college work tend to eliminate the professional elements in their assignments. It could not be said that all schools are capable of producing any desired pictures. There are several new classes that must have time to become established. Some teachers have the ability and need only experience to broaden their teaching limits. The Oklahoma schools have shown that every phase of photography can be successfully taught if sufficient equipment is available and a well-trained teacher is employed.

Schools That Have Discontinued Photography. Very few schools have discontinued photography once it was offered. Those that have discontinued photography give the cost of operation and the loss of the teacher as the primary reasons. One principal reported he could not find a qualified teacher. There is not an abundance of available data on this

TABLE XII

SCHOOLS THAT HAVE DISCONTINUED PHOTOGRAPHY

City	School	Date	Reason
Fittstown	McLish	1950	No reason given
Midwest City	Midwest City	1948	No students enrolled
Mill Creek	Mill Creek		Photography approved but never offered
Ponca City	Ponca City		Incorrect data, never offered
Quapaw	Quapaw	1953	Teacher transferred
Thomas	Jabbok Bible	1954	No funds available
Waynoka	Waynoka	1953	Teacher transferred

subject. The returned questionnaires indicated the reasons for discontinuance. As visits to these schools could not be scheduled, the

questionnaires are the only source of data. Table XII (page 108) lists the schools that have indicated they have discontinued photography, and the schools that were listed in the survey of this study but were not used as a source of data.

Photography appeared in the Oklahoma high schools in 1945. Since that time twenty-two schools have offered photography. At the persent, seventeen schools are engaged in some form of photographic activity. One school had notified the author of intent to offer photography in the school year of 1955-56. Three schools have indicated plans to expand their programs. One school, at the present, plans to discontinue photography next year. The problems of space, equipment, and funds have been reported. The various types of programs were described. Teacher experience was discussed. The author attenpted to give a valid interpretation of the data. No doubt errors are present in the data, but not due to insincere reporting. The following chapter contains a summary of the survey and the author's recommendations and suggestions for furthering photography as a part of the general education program.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The scope of this investigation included only the seventeen Oklahoma high schools now offering photography. Eight of these schools are under the jurisdiction of one Board of Education. The conclusions resulting from the survey should be considered in the sense of suggestions rather than recommendations due to limited sources of data.

Summary of the Survey. The survey shows that a total of twenty-two Oklahoma high schools have offered photography as part of their curriculum. Photography first appeared in the Oklahoma State Department of Education records in 1945. At the present time, April 1955, there are seventeen schools offering photography. Two of these schools offer instruction in photography in alternate years. It was found that the objectives of the photography class varied as to the school need. In some cases photography is devoted wholely to school activities. In other cases no emphasis is put on school work, and photography is taught as an independent subject or as a part of other fields of education. There is only one subsidized vocational education photography class now being offered. Eight of the seventeen photography classes are offered through the division of industrial arts, either as an independent field or as a part of the graphic arts department.

The past experiences of the teachers are an influencing factor in the type of program being offered. Those teachers with professional

experience tend to emphasize this phase of photography. It was found that only a few of the present teachers had planned to teach photography and had taken preparatory educational work in the field.

Space and facilities are the critical problems in many of the schools. The recently built schools have been designed with provisions for instruction in photography. Older school buildings have had to make use of any available space. In some instances the facilities are extremely limited and tend to make instruction difficult. As the interest in photography continues to grow, providing space and facilities will prove to be a major problem of the school.

A lack of photographic equipment is very evident in the majority of the schools. The variation in the objectives of the photography classes is the factor that determines the equipment needed. Operational and equipment funds are generally limited. The instructor can obtain equipment only when such funds are available and a need for the equipment can be proven.

Instructional procedure to be followed is determined by the function of the photography class. Instruction and operation sheets are used in some classes as a means to standardize the experiences of the students. Photographic work needed by the school is the governing factor in the instruction of other classes. Evidence was found that revealed an attempt to standardize instruction by joint planning and preparation of a course outline by the photography teachers of one large school system. The method of instruction is generally based on the teachers' comprehension of photography and past experiences in the field.

Conclusions. The survey indicates that the Oklahoma high schools offering photography have recognized the potentials of photography as a part of the educational program. No data was found to show that any school discontinued photography for lack of educational possibilities. The recognition of photography as part of the education program is shown in the design of new school buildings by the provisions that have been made for darkrooms and work areas. Although photography is recognized as being of value to education, there are several factors preventing the widespread use of photography. Problems of space, lack of funds, and the small number of qualified teachers are the major factors preventing the widespread use of photography in the schools. The majority of the photography classes are hampered by the lack of space. This condition is recognized, but funds and space are not available to relieve the situation. The variety of equipment in use indicates that a study should be made to determine what type of equipment would best suit the needs of the photography class. The problems envolving space and equipment should be studied by those who are interested in furthering the educational use of photography.

The teacher is the greatest factor affecting the value of the photography class. The photographic training of the teacher is the source of experiences for the student. The teacher should have a practical working knowledge of photography and a reasonable degree of skill if the student is to benefit from the teaching. Formal educational training does not allow for the developing of skill. Professional experience or training devoted to the commercial fields of photography would be invaluable to those who plan to teach photography.

The success of the photography class in terms of the value to the student and the value of the services offered to the school is dependent upon the teacher. The fate of the photography class rests with the teacher.

A student soon tires of work exercises without purpose. The various photographic services rendered the school furnishes useful purpose for photography assignments. In this sense, the photographic work required by the school provides an extrinsic value to the learning of photography. School work that does not compete with available professional photography services should be a part of the photography program.

There are several teaching methods in use that are proving successful. In some cases the class interest directs the teaching; in other cases the teacher directs the study to the completion of work to be done. The use of prepared instruction sheets by other teachers is providing an orderly learning process. A planned outline can assure that certain phases of the instruction will be performed by all students. The use of instruction sheets giving the assignments, references, and operations would eliminate confusion caused by students waiting for equipment or waiting for an assignment. The instruction sheets should cover the basic operations and processes. A part of the student's work should be devoted to his personal interests.

There are certain operational expenses that are necessary in teaching photography. If the school cannot absorb this expense, then a fee must be required for the course. The fee problem has not been solved. Several schools are not meeting the cost of operation by the fee that is charged. The deficit is made up by the sale of activity

pictures to the students or from other school funds. A fee should be established that would be sufficient to cover the cost of materials needed for the required assignments. The school should make arrangements for those students who are not financially able to pay the fee in this course.

The conclusions drawn from this survey were formed by personal opinion. Others could have interpreted the conditions differently and would have arrived at different conclusions. As the use of photography in the high schools becomes more common, an association might be formed for the photography teachers. An organization of this type could analyze conditions and make conclusions that would aid the photography teachers. The conclusions of this survey were not intended as criticism, but were presented in the interest of aiding the growth of photography in the Oklahoma schools.

Recommendations. There are many factors worthy of consideration in planning a course in photography. Valid recommendations should be made from large samplings of established courses. The recent development of photographic education in the Oklahoma high schools offers a limited source of data. As a results of this survey, the following suggestions are presented.

The school administration planning a new course in photography should seek advice from all available sources concerning the equipment, facilities, and purposes of the photography class. The objectives of the photography class should be established before the equipment and facilities are planned. Serious thought as to the possible future growth and needs of the class could relieve the future

possibility of inadequate facilities and inefficiently designed work areas. The qualifications of the available teachers should be an important factor in determining the objectives of the class. The photography class should be established as a permanent part of the school's educational program with definite functions and objectives.

The growth of the use of photography in the schools has been indicated. This will mean an additional group of new teachers must be supplied. The state teacher education schools should make preparatory courses available for those who wish to enter this field of education. Efforts should be made to establish a policy of certification to assure adequately trained teachers and to establish the position of the photography teacher. State-wide organizations could be formed for the purpose of directing study to the problems of teaching photography. The photography teachers should attend programs or meetings concerning the use and application of photography. At the present time, plans are underway at Oklahoma Agricultural and Mechanical College for a workshop clinic devoted to the teaching of photography in the secondary schools. This is believed to be the first time such a clinic has been offered. The teacher should practice photography to increase his knowledge of the applications of photography and the new products and processes that are being developed.

The many variables as to the size of the class, the objectives of the class, the objectives of the school, and the available funds determine the equipment needed. A standard list of equipment would be difficult, if not impossible, to prepare. The recommended procedure would be to seek advice from the schools now offering photography, from the

professional photographers, and from distributors of photographic equipment. Versatile equipment of good quality can best fill the needs of any photography class and give better service.

The problem of supplying materials is difficult to solve satisfactorily. Either the school or the student must furnish the needed materials. The most efficient procedure would be for the school to furnish a required set of materials that would be sufficient for class assignments and to charge the student a fee for these materials. Arrangements should be made by the school to procure the materials for the students who are unable to pay the fee. Any material needed for personal work should be furnished by the student. The fee should be adequate to cover the cost of the materials and chemicals, and to make repairs or replacements of equipment as needed. Planning and study are required to determine an adequate but not prohibitive fee.

Many inefficient conditions were noted in the various darkrooms that were visited. Some of these conditions were due to making use of unplanned space. The modern school is of compact design, making use of work areas with several activities in progress in one room. The photographic laboratory, in this case, is confined to one section of a large classroom. The facilities must be planned to utilize efficiently the area designated for photography. The plumbing and electrical installations must be adequate to meet the needs of the class. Ventilation also must be considered as a necessity. The idea of individual darkrooms for each student is prohibitive due to cost. This arrangement does not allow for cooperative learning among the students. Darkrooms capable of allowing a group of students to work simultaneously provide

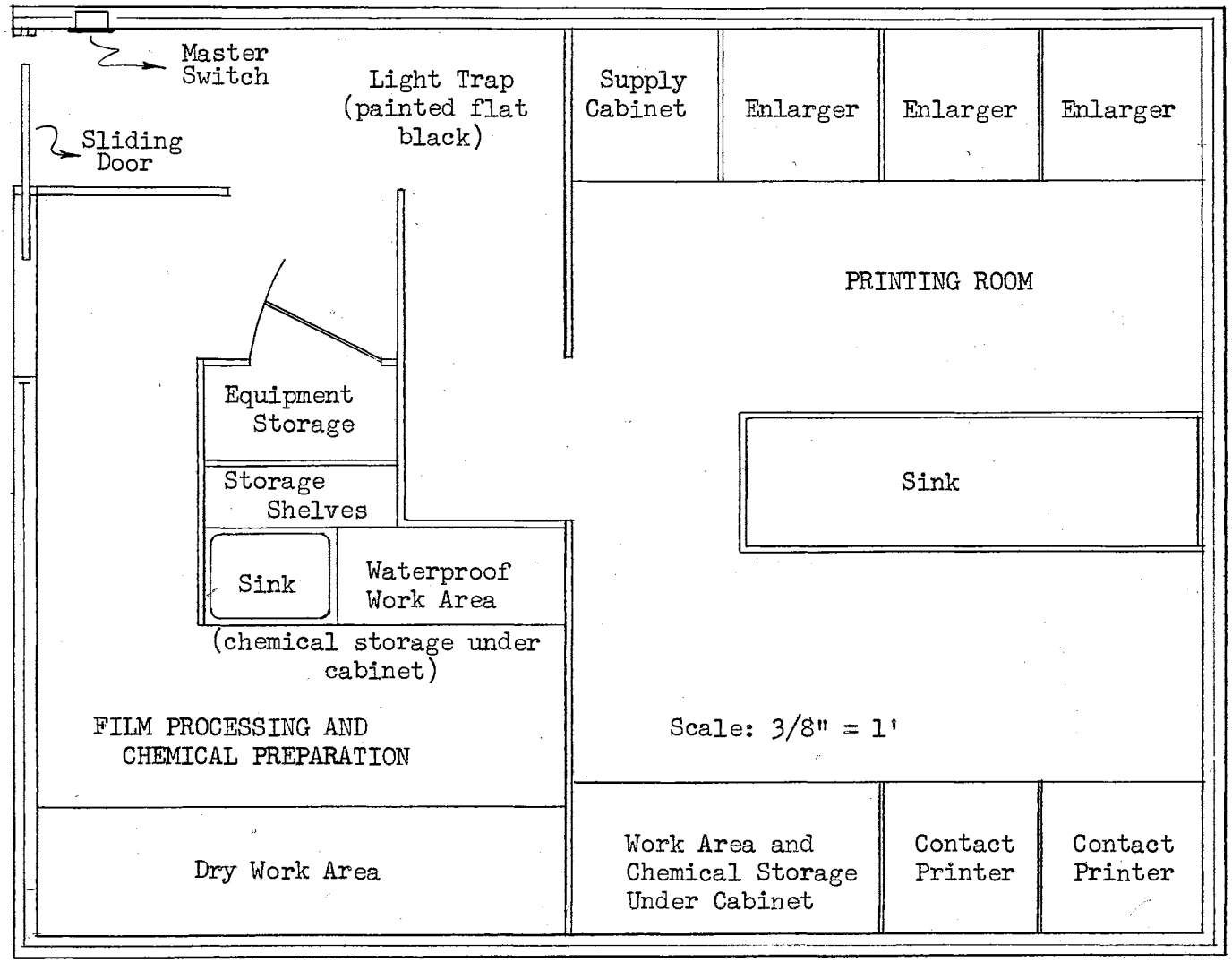

FIGURE 1. SUGGESTED PLAN FOR DARKROOM LAYOUT

better learning situations and the use of less space. The practice of storing materials and equipment under work cabinets that are used both for wet and dry work is not advisable. The work requiring dry conditions should be separated from the wet work area. Materials and equipment are not subject to damage from moisture and corrosion by this arrangement. Figure 1 (page 117) shows a darkroom layout that could permit seven to ten students to work simultaneously and efficiently in less than 275 square feet of floor space. This plan allows for equipment storage, chemical storage, and material storage in addition to providing facilities for film processing, printing, and chemical mixing. The wet and dry areas are adequately separated to prevent damage to materials and equipment. Ventilation is aided through the use of light traps. A sliding door at the entrance to the light trap provides a means of locking the darkroom. The master switch is located in a convenient position at the entrance to the darkroom. Washing, drying, and photographing work areas could be located on the outside walls.

Figure 2 (page 119) shows a suggested construction plan for the printing room cabinets. The work area for each student is separated by a partition. A shelf is provided to accommodate the printing materials. A drawer could be fitted to the shelf to provide storage space for the student's materials. If space is available, the drawers could be stored in an outside cabinet when not in use. The darkroom layout shows the possibilities for maximum utilization of space through planning.

The use of photography in education will increase with time. The demand for qualified teachers will lead to the establishing of preparatory programs in teacher education institutions. The school administration

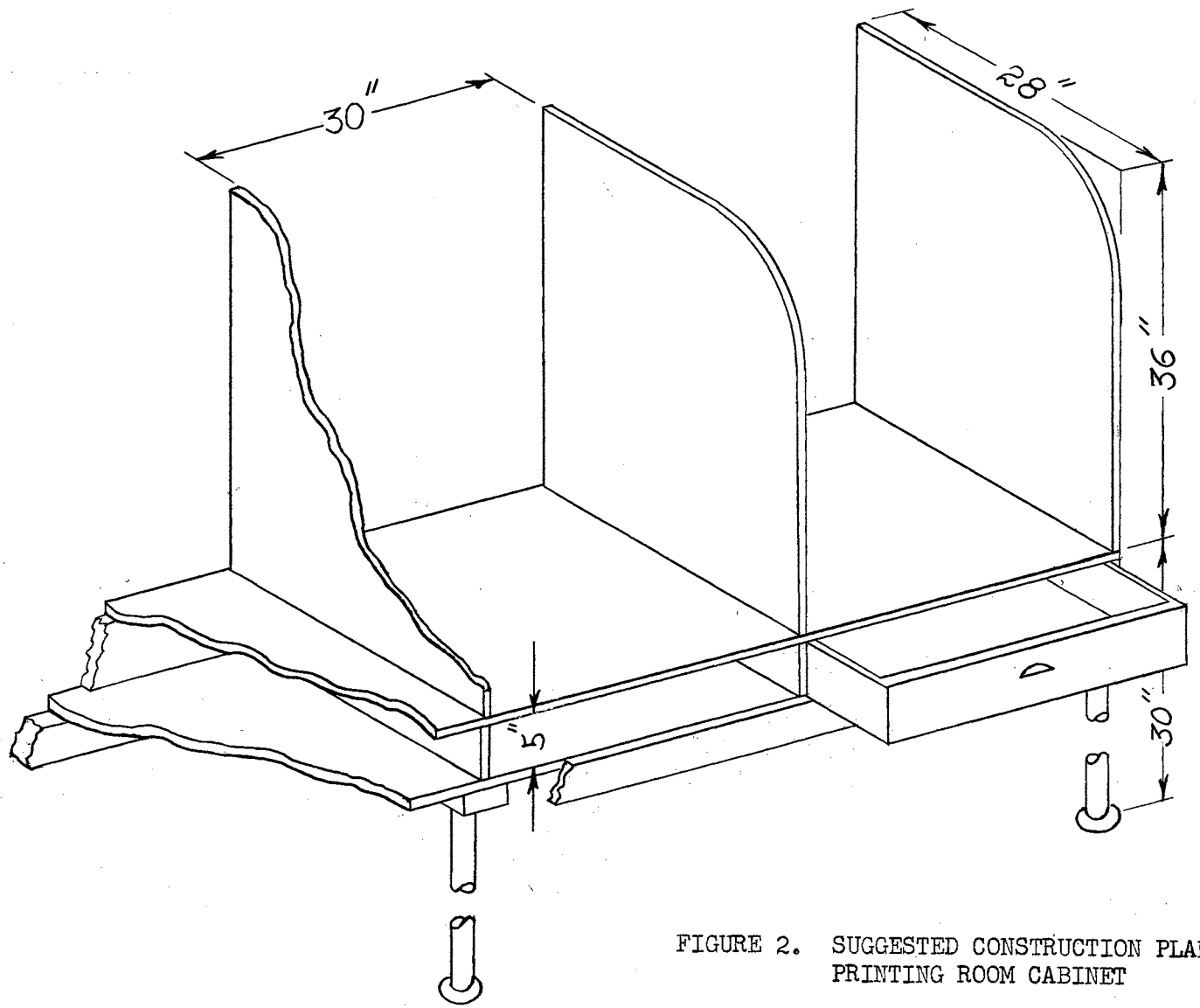

FIGURE 2. SUGGESTED CONSTRUCTION PLAN FOR PRINTING ROOM CABINET

and the photography teacher should work together to plan efficient offerings in the field of photography. Careful planning and analyzing of conditions and needs will lead to more efficient facilities and better instruction for the student. It is hoped that this survey can serve in the establishing of photography as part of the general educational offerings of the Oklahoma high schools.

APPENDICES

A. A Selected Bibliography

B. Letter of Inquiry

C. Questionnaire

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OKLAHOMA INSTITUTE OF TECHNOLOGY
OF THE
Oklahoma Agricultural and Mechanical College
SCHOOL OF INDUSTRIAL ARTS EDUCATION
AND ENGINEERING SHOPWORK
Stillwater, Oklahoma

I am writing a thesis in partial fulfillment of the requirements for the degree of Master of Science at Oklahoma A. and M. College on the growth and development of photography as a part of the general education program in the Oklahoma high schools. I am particularly interested in the relationship between photography and the industrial arts program.

The State Department of Education records show that photography in industrial arts first appeared in 1946 at Midwest City, Oklahoma. At the present time, sixteen schools offer photography as an accredited course, varying from one-half to two units of credit.

My purpose is to accumulate data concerning equipment, space, laboratory design and programs of study that can be used to aid schools that wish to add photography; to help improve methods of instruction; and to show that photography may be a part of the general education program. Due to the small number of schools offering photography in Oklahoma, I would appreciate your filling out the enclosed form as soon as possible. Space is provided in the questionnaire to indicate when it would be most convenient for me to visit your school.

Sincerely yours,

John E. Watkins, Instructor
Photography Department

Approved:

C. L. Hill

C. L. Hill, Thesis Advisor

SURVEY OF PHOTOGRAPHY IN THE OKLAHOMA HIGH SCHOOLS
Spring 1955

Name of School: City: County:

Principal: Photography Instructor:

Special photographic training or background:

---

1. If photography is not offered at the present time, please indicate with the date it was discontinued. _____

   Please fill out this form as it applied to the last semester photography was offered and explain why the course was dropped.

2. Indicate number of accredited units offered: _____

3. Indicate number of students enrolled in photography by years.

Year	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51
1 Sem.						
2 Sem.						

Year	1951-52	1952-53	1953-54	1954-55
1 Sem.				
2 Sem.				

4. Is photography taught as a vocation, part of another course, by itself, or as a hobby. (Indicate by underlining and explain.)

5. Is there a camera club sponsored by the school? _____

6. Is there a classroom available for lectures? _____ Can this room be darkened for demonstrations? _____ Is there a studio or a shooting room separate from the lecture room? _____

7. How many students can the darkroom accommodate? _____

   How many hours per week are spent in theory? _____ lab.? _____

   How many hours per week are the students allowed to work in the laboratory? _____

8. Equipment:
What equipment does the student furnish?

School Owned Equipment:
A. Cameras:(size, make and quantity)

B. Enlargers: (size, make and quantity)

C. Contact printers: (size, make and quantity)

D. Developing equipment:

E. Dryers:

F. Other equipment:

Please indicate why this particular equipment was purchased and make suggestions for or against the above equipment. List any equipment you think might be better suited for high school photography classes.

9. Materials:
Do students furnish their own paper? _____; film? _____; chemicals? _____. Does the school furnish the materials for printing, developing and finishing? _____ (If the answer is yes, how is the student charged?) _____. Please give remarks or suggestions concerning the handling, the supplying and the charging of materials.

10. Does the photography class do work for the school? _____
Explain.

11. List any special or unusual equipment or work connected with the photography class.

12. Would you like a copy of this report? _____

13. Please indicate the time most convenient for an interview.

Date: Place: Hour:

When will the class be in session? Date: Hour:

VITA

John Edmund Watkins
candidate for the degree of
Master of Science

Thesis: THE DEVELOPMENT OF PHOTOGRAPHY AND PHOTOGRAPHY IN THE HIGH SCHOOLS OF OKLAHOMA

Major: Industrial Arts Education

Biographical and Other Items:

Born: December 30, 1921, at Peason, Louisiana

Undergraduate Study: Oklahoma A. and M. College, 1939-1949.

Professional Study: New York Institute of Photography, 1948.

Graduate Study: Oklahoma A. and M. College, 1949-1955.

Experiences: Army Air Force, Brooks Field Photography School, 1942, Duncan Field Photography School, 1942, Photographic Service in South Pacific Area, 1942-1946, Sergeant; Oklahoma A. and M. College, Student Instructor, 1941 and 1946-1949; Instructor, Photography Department, School of Education, Oklahoma A. and M. College, 1950- .

Member of Kappa Delta Pi, Iota Lambda Sigma, Phi Delta Kappa, Oklahoma Industrial Arts Association, and American Industrial Arts Association.

Date of Final Examination: May 9, 1955.

THESIS TITLE: THE DEVELOPMENT OF PHOTOGRAPHY AND PHOTOGRAPHY IN THE HIGH SCHOOLS OF OKLAHOMA

AUTHOR: John Edmund Watkins

THESIS ADVISER: Cary L. Hill

The content and form have been checked and approved by the author and thesis adviser. The Graduate School Office assumes no responsibility for errors either in form or content. The copies are sent to the bindery just as they are approved by the author and faculty adviser.

TYPIST: Dorothy Watkins