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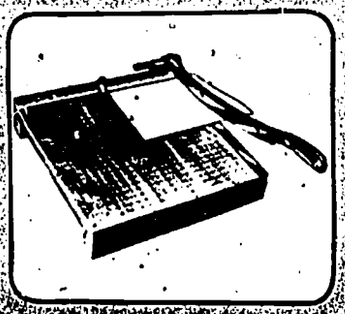
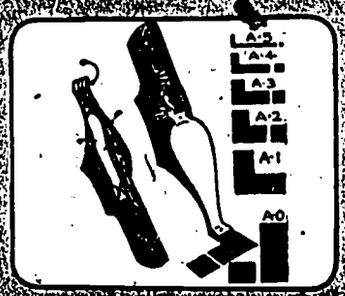
ABSTRACT

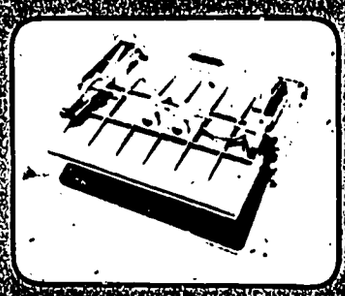
This step-by-step guidebook explains how to make and use audiovisual aids in the classroom. It is intended for the teacher. An introductory section explains basic principles of graphics and suggests processes and materials which can be made use of. Other sections explain the production or use of perspective drawings and illustrations; still, slide, or movie photography and photosketching; lettering; dry and wet mounting; laminating and framing; tape recorders; transparencies; and displays such as bulletin boards, models, and dioramas. A final section explains duplicating processes. (JK)

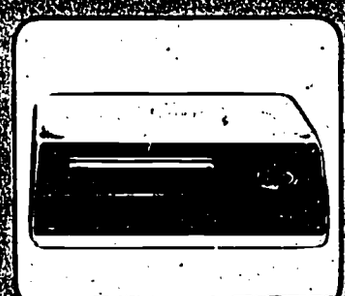
INSTRUCTIONAL MEDIA CURRICULUM GUIDE

Production Techniques for Classroom Teachers (K - 12)









BETTER COMMUNICATION THROUGH MEDIA

Materials Developed by the
State Committee for Educational Media and Technology
in cooperation with the
Instructional Media Section
Curriculum Section
and
Oklahoma Curriculum Improvement Commission

OKLAHOMA STATE DEPARTMENT OF EDUCATION
Leslie Fisher, State Superintendent

INSTRUCTIONAL MEDIA CURRICULUM GUIDE

PRODUCTION TECHNIQUES FOR THE CLASSROOM TEACHER

GRADES K–12

Materials Developed by the
THE STATE COMMITTEE FOR
EDUCATIONAL MEDIA AND TECHNOLOGY
in cooperation with
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OKLAHOMA STATE DEPARTMENT OF EDUCATION
Leslie Fisher, State Superintendent
1972

FOREWORD

Educators and teachers are faced with an ever changing role, in which the goals and objectives of education must constantly be evaluated and reappraised.

The public is demanding more accountability in how the school dollar is spent, while demanding more educational improvement.

Information is much more abundant. Commercial materials are being supplied in many forms through numerous sources. There is a constant need to bridge the gap between that which is available commercially and what is needed by the instructor.

It is our hope that this publication will be helpful in closing that gap and will serve as a valuable guide for the production of instructional materials.

Leslie Fisher
State Superintendent
Of Public Instruction

ACKNOWLEDGEMENT

The Oklahoma Curriculum Improvement Commission and the Oklahoma State Department of Education wishes to express a sincere appreciation to each member of this committee for the contributions made in the development of this guide.

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CONTENTS

SECTION VI

SECTION VII

SECTION VIII

SECTION IX

INTRODUCTION AND PHILOSOPHY

The study committee on production of materials was formed from the membership of the Oklahoma Association for Educational Media and Technology. The committee's responsibility was to develop a curriculum guide which would suggest helpful ideas in the production of materials for classroom utilization.

The committee did not attempt to cover all areas of production, but limited their work to chosen subjects due to time allotted and the necessity for limitations in the size of the guide. It is hoped that some of the ideas and techniques developed in the material will help with the suggested topic and encourage teachers toward creative and constructive planning in other fields of production, using modification of these and other techniques.

Instructional program development and, in particular, the development of teacher made materials for learning are usually the direct results of an identified need.

In recent years there has been an encouraging emphasis in this country on the desirability of educational institutions and teachers thinking more precisely about instructional goals. This approach to the education program is sometimes referred to as a goal-referenced instructional model and, basically, stresses the question of what observable behavior the learner should possess at the conclusion of instruction. A goal-referenced instructional model encompasses the establishment of goals which provide a universal, continuing purpose and measurable objectives to provide a timetable for reaching the destination.

The same question should be of concern to a teacher considering the production of teacher-made media. In order to plan an effective instructional media presentation, a teacher must have a set of well defined behavioral objectives. The teacher undertaking the production of materials for learning must organize the objectives into an appropriate sequence and place them in a suitable time frame.

In addition, the complex objectives must be divided into more simple subobjectives which are designed to reach the overall goal. The "teacher made media" is an excellent vehicle to use in accomplishing the measurable objectives which provide the building blocks to reach the instructional goal.

In essence, a media presentation *must not* just be something that looks good, but it must be designed to accomplish a distinct measurable objective in accordance with the goals established for the learner.

INSTRUCTIONAL MEDIA PRODUCTION TECHNIQUES

SECTION I

Planning The Visual

Once having decided what, in the way of content, is to be presented, the need for ideas related to layout, design, lettering, color, and so forth, is usually the first concern of the producer of instructional media. Here are suggested a few idea sources and their application to creating and preparing such materials as posters, charts, graphs, bulletin boards, displays, and transparencies.

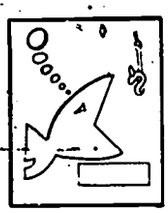
Magazines, newspapers, picture brochures, travel posters, and direct-mail pieces are just a few of the many sources of excellent ideas that can be modified to create quality instructional media. Only one idea may come from a given source, such as an idea for the arrangement of lettering or pictures. A particular idea source may serve only to suggest possible color combinations, but this will be an important contribution to the finished product.

In many cases, however, one visual source, such as a picture brochure, may contain enough ideas to plan a poster. The first step, after consideration has been given to size, type of visual, and lettering, is to make a rough sketch of the poster, using the brochure as guide. Modifications can be made to come up with the desired end product. Once the rough sketch has been finalized, the next step is that of actually producing the poster.

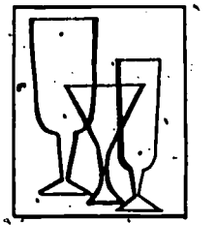
Although this means putting an idea to work and may not seem "professional" in structure, it is a quick, easy way to produce a quality visual material.

IDEA SOURCE FILE:

To collect ideas related to layout, illustrations, color combinations, and lettering, start an idea file. It can include clips from magazines, newspapers, brochures, direct-mail advertisements, notices, announcements – literally any printed material.



Break up the space interestingly with "breathing space" between the items within the working space.

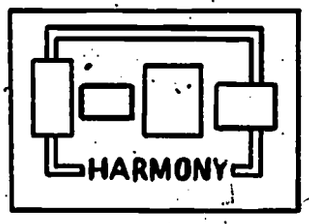


Use the space available. Remember that this is a composition, and the various items must be planned, or composed in relation to each other, and in turn to the enclosed area.

FUNDAMENTALS OF DESIGN:

In order to create effective graphics; it is necessary to understand some of the basic fundamentals in creating materials. After gaining a basic understanding of design, the creator will be able to communicate a message that is both educationally sound and esthetically acceptable.

The fundamentals of design can be characterized as harmony, balance, and rhythm. It is necessary to consider each of the factors separately. When considered collectively they represent a sensitivity to design and help the individual to create materials in an effective manner.



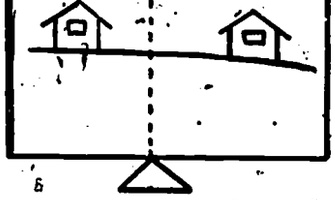
Here the various items agree as to shape, character of line, and relationship within the space provided.

Harmony may be defined as agreement or oneness, and it may be said that two things are in harmony according to what they have in common. It may be achieved with the use of several different factors related to the elements and fundamentals of design. A common direction whether it be horizontal, diagonal, or vertical, size and shape which may be similar or dissimilar in basic construction, or a common color will give harmony. A color may be bright or subdued, but when using two colors, they must contain essentially the same basic component. In other words, a red in one area may also be used and may be depicted as a smooth or rough surface.

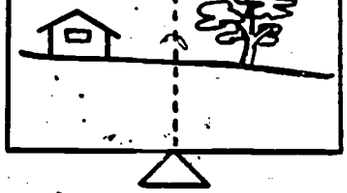
Whenever any two or more things are in agreement, the graphic is said to have some degree of harmony. It is necessary that the design contain enough harmony to prevent chaos, but enough variety to prevent boredom.

The second fundamental is *Balance* which may be defined as the equilibrium achieved between two bodies or two divisions of the graphic. If

two bodies of equal size, shape, color or texture are utilized, balance will be achieved in relation to a pivot point, creating formal balance.



Formal Balance



Informal Balance

If the two bodies are of the same density but unequal in size, the result is informal balance.

Balance is achieved when the smaller object is placed farther from the pivot point. A pivot point may be considered as being the center of the field of vision of the entire graphic. Balance is also achieved through the use of color. They may be accomplished by weighing cool against warm colors in regard to the space which they occupy. A large cool area, using a color such as blue, will balance a small warm area, such as red. When balance occurs, there generally must be a consistency of value for lightness and darkness of the color being used. Background colors may also be influential in determining balance. Balance in design is very seldom achieved with one item alone, such as size, color, shape, or direction. It is rather an equalizing of all of the attraction forces of a design as they react with and influence one another.

The third fundamental is *Rhythm*, which refers primarily to movement. Stability or lack of movement is achieved in a static, symmetrical unit where all aspects shown may be considered mirror images by using a vertical or horizontal dividing line. Movement is usually directional and creates a dynamic force which causes the eye to move from one point to another over the surface of the design. It may be achieved in regular measure and in definite direction. It may also be achieved where the direction is consistent but the size changes noticeably from large to small or small to large.

Rhythm

Repetition can be achieved through the use of size and shape of objects into a specific pattern and with the use of color or value.

It is necessary to achieve an interrelationship of these three principles in order for a design to be effective. Designs must have harmony. It is possible to achieve harmony without balance and rhythm. However, a design falls short of its total effect, if there is little or no balance or rhythm within the total context of a visual impression.

HOW TO EMPHASIZE:

There are several ways in which we may attract attention to the important part of a design. Some of these are:

1. By use of contrasts of hue, value, or intensity
2. By leading lines
3. By unusual detail
4. By grouping or placing of objects
5. By attraction to the unusual, out of the ordinary

ELEMENTS OF DESIGN:

The elements of design are basic components which combine to create the total effect desired for a visual impression of an idea.

Line as an element is used in order to achieve results with other elements. Line alone has little meaning. It is possible to have variations of line for specific effects. It may be bold or delicate, curved, angular, or straight, black or colored, even or uneven, or it may represent free flowing linear movements through a combination of any of the above factors.

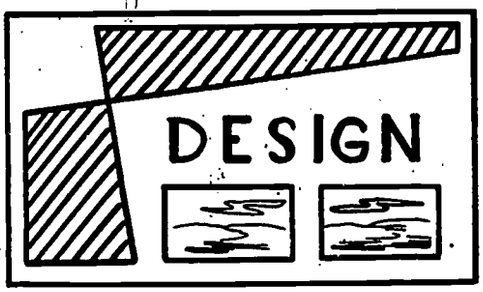
Shape is a means of defining an area of surface by providing dimension and visual realism. When lines are turned into shapes, they have realistic meanings.

Design

Design: Thumbnail sketches are useful as we transfer our thoughts to paper.

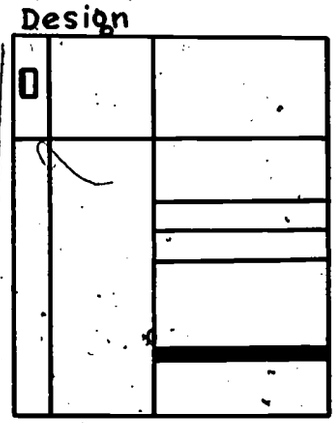
Texture may appear to be rough or smooth, hard or soft, and is a means of giving detail to structures depicted. It generally has the effect of conveying a sense of touch to the viewer. Texture may be developed

through the use of line, or it may be achieved through actual textural material of a three-dimensional nature. When three-dimensional materials are applied to graphics, such materials must be lightweight and in keeping with the general context of the message.



Value is the lightness or darkness of an object in terms of the visible light reflected. It will range from absolute light to absolute dark and may be applied to any color which is used in the material. Value is often used as means for adding dimension to an object.

Color is used for emphasis and definition. Bright colors convey the impression of gaiety while subdued ones convey quietness. Specific effects may be achieved through color with the application of value. It is best to use varying amounts of color in dominating roles to achieve a desired effect. It should be used as an important factor in depicting an idea, but it should not be used for the sake of color alone.

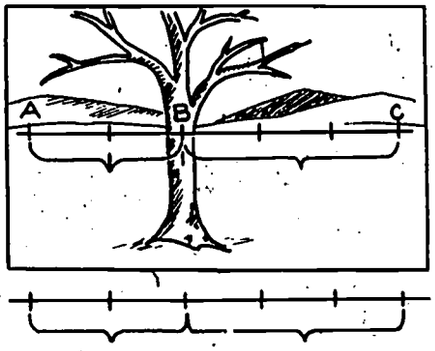


"Composition in Black White and Red" By: Piet Mondrian

Volume represents the mass which occupies the space which is encompassed. It represents the totality of a visual impression and implies both solids and voids in terms of space utilization.

The combination of all the elements applied to the fundamentals of design will present an esthetic and informative visual impression. If the elements are thrown together at random and appear to have no organization, they produce chaos. A basic understanding of elements and fundamentals of design will give teacher and students tools with which to work in order to create effective graphic materials. It is only through an understanding of the tools with which one has to work that a higher level of accomplishment in graphic production can be achieved.

SPACE DIVISION



SPACE DIVISION IN DESIGN:

When dividing a space or a line into two parts, like the above, placing the division close to B would probably be more satisfactory than placing the division (or center of interest) exactly at B or in the center of the line. The space should not be divided exactly in the ratio of 2:3 nor in the exact center. When dividing any space into two parts, the individual should avoid dividing the spaces into two equal parts because interest is lost and there is a danger of boredom. The design must attempt to develop two parts that achieve interest and are still related. Regardless of the type of balance employed in a composition, every design needs some note of interest that catches the eye or arrests the attention. This quality may be referred to as the center of interest, point of emphasis, or dominant area. It involves the principle of design which leads the eye first to the most important part of the design and then to other subordinating areas in the order of their importance. There may be several centers of interest, although one will be more dominant than the others and will arrest the attention longer and draw the eye back to itself more frequently than will the lesser centers of interest. Otherwise, there would be competing areas of emphasis which would cause

confusion. When we speak of a center of interest, and for that matter, informal balance, the illustration above may prove of some value.

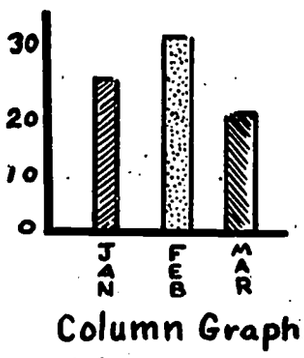
Whenever we speak of designs, whether we are referring to drama, music, drawing, sculpture; architecture, or the dance, we are concerned with an understandable unit, complete within itself. As in music, all melodies, harmonies, words, should contribute to its organized over-all effect.

The same is true of visual arts. When we create a drawing, a poster, or a tabletop display, we find that it will be most successful and understandable if it has unity – if all parts are designed to carry out one complete effect. Thus we conclude that a basic purpose of design is to produce a comprehensive, satisfying oneness within the borders of the art work, be it a poster, a painting, or a clay model. It is important, however, as we inspect design elements and principles that a happy balance of variety be achieved within the unity of the work.

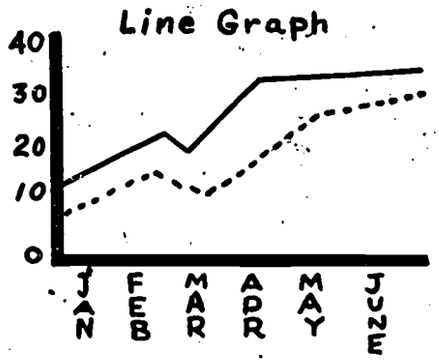
Graphics – Planning

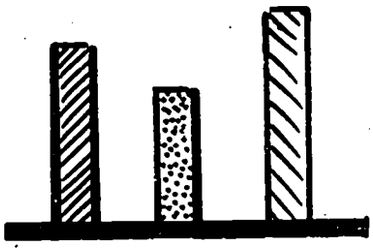
Graphic materials may be defined as materials which communicate facts and ideas clearly and succinctly through a combination of drawings, words, and pictures. They are particularly well suited to the presentation of information in condensed summary form; the presentation of quantitative information as on graphs; the illustrations of relationships as on charts, maps, graphs, and diagrams, and the representation of some kinds of abstractions as in cartoons, diagrams, and charts.

The type of graphic materials commonly employed in teaching include graphs, diagrams, charts, posters, cartoons, and comics. Each type has certain unique instructional applications.



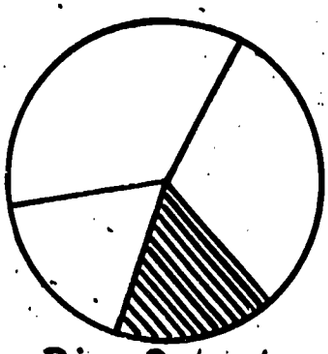
Column Graph



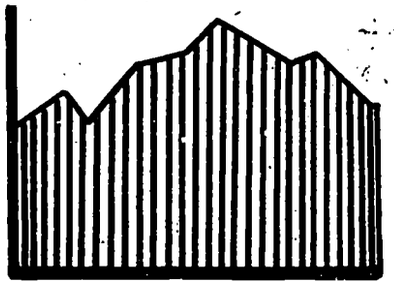


Bar Graph

Graphs are visual representations of numerical data. They show quantitative relationships more effectively than any other medium, but like diagrams, they require a background of experience and information to be effective as teaching devices. Typical forms are line graphs, bar graphs and pictorial graphs.

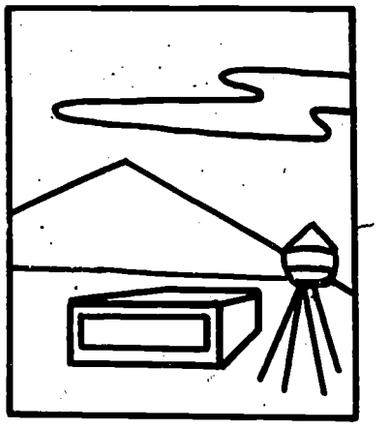


Pie Graph



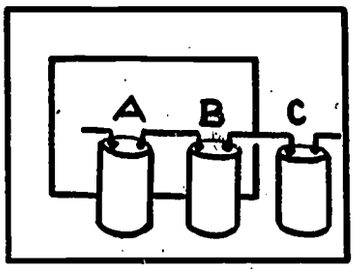
Surface Graph

Diagrams are simplified drawings designed to show interrelationships primarily by means of lines and symbols. Diagrams are highly abstract and have a minimum of detail; hence they require a background of information before they can be used effectively with students.

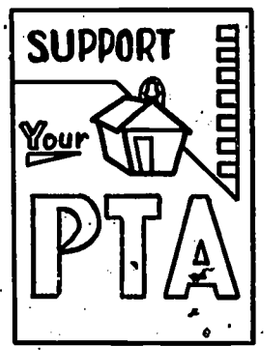


Diagram

Charts are combinations of various graphic and pictorial media designed to visualize relationships between key facts or ideas in an orderly and logical manner. Typical forms are the tree chart, and the flow chart, or the tabular chart.

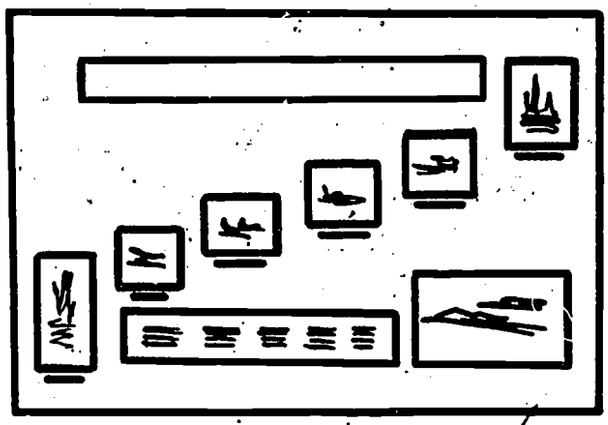


Chart

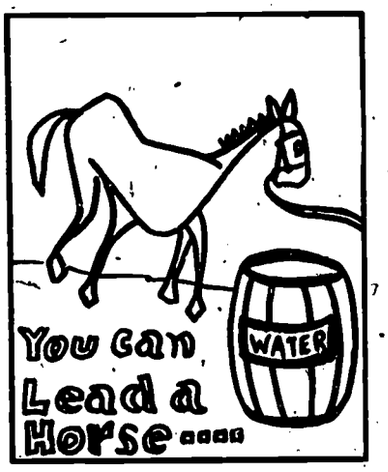


Poster

Posters are large-scale simplified pictorial illustrations designed to attract attention to key ideas, facts, or events. They are inherently simple and dynamic. Their function is primarily to motivate, arouse interest, remind, or advertise.



Poster



Cartoon

The cartoon is a pictorial representation or caricature of a person, idea, or situation designed to influence public opinion. Political cartoons are a source of information with a strong visual impact based upon sharp, compact drawings and humor of some type. There is some evidence that cartoons are chiefly valuable for teaching at the secondary rather than the elementary level partly because most commercial cartoons are prepared for adult readers.

Cartoon

Comics

Comics are a form of cartoon in which the same characters enact a story in a sequence of closely related pictures designed to entertain the reader. Although comics have achieved extensive popularity purely as an entertainment medium, certain materials in this category have definite educational values. Their extensive use of colorful illustrations, of a rapidly moving story, and of realistic people as characters appeal to students of all ages. Comic books are being used effectively by teachers to arouse interest, to develop vocabulary and reading skills, and to serve as springboards into broader reading interests.

Most graphic forms can be made rather readily by teachers and pupils. Production of graphics in the school is warranted (1) when suitable graphics are not otherwise available, (2) when preparation will help significantly in understanding of the subject, and (3) when preparation will help the students materially in interpretation or evaluation of graphic forms.

Teachers and students alike will find a variety of materials which may be used easily in the construction of graphic materials. The fact that the materials are easily obtained and can quickly be turned into a communication tool provides the teacher and the student with the unique advantage of being able to create those materials needed for classroom use in a relatively short period of time.

The production of graphic materials is often considered a chore by many teachers, since they express an inability to draw or to be artistic. It is not necessary to be an artist, but it is rather important that the person be willing to attempt to convey facts through the proper selection of graphic materials. Even though the finished product may not be artistic, neatness will go a long way in providing an attractive material which will meet standards imposed by teachers or students for instructional materials.

ADVANTAGES OF GRAPHICS:

An inherent advantage of any graphic material is its ability to attract

attention and, therefore, communicate to the viewer quickly and succinctly. Graphics themselves attract attention best when designs have been considered and the overall product meets this basic requirement.

Graphics summarize information, teach facts and processes, relate an idea, and attract attention. They may be quickly made by teacher or student. Materials for graphics are readily available and a variety should be used.

PREPARATION OF THE VISUAL:

Present one basic idea, keep it simple, organize the layout, be legible, and create visual balance.

HOW TO MAKE GRAPHICS:

Teachers develop their own techniques as they gain experience in preparing charts and other graphic forms. The following principles and suggestions came from a number of teachers and graphic artists over a period of years.

1. Lay out a plan on a small sheet of paper. Make it clear to the pupils that planning lies behind any worthwhile work. Before you complete the chart, sketch in principal lines and lettering lightly on the large chart surface. This is also a good opportunity to introduce simple principles of design to the pupils.

2. Keep the graph, chart, poster, etc., simple. Remember, a good graphic presents one principal idea or comparison. When it becomes intricate or complicated, it loses effectiveness.

3. Choose a terse, simple title; allow the pupils to help. Few pupils understand the virtue of economy in words. Use bold but simple letters; fancy lettering is seldom effective.

4. Make it attractive. Plan for contrast, color, and plenty of space. Employ pictures, graphs, or other illustrations as suitable, occasionally using colored construction paper for background outlines and for emphasizing important sections.

5. Avoid crowding or using too many illustrations or other elements. When you use color, keep the colors harmonious. Don't overdo colors or the purpose of the chart may be missed.

6. Make the graphic large enough to be read easily from anywhere in the room. Use an opaque projector to enlarge your planning sketch to desired size.

Among the drawing and painting tools that are most useful in developing teaching materials are chalks, crayons, colored pencils, pens and inks, brushes, and paints, and silk-screen equipment. These tools may be used for writing or drawing on a variety of surfaces including chalkboard, papers, cardboards, and fabrics. A teacher's skill in using these media appropriately is developed as he understands the tasks for which each is best suited and as he experiments with them.

MATERIALS FOR MAKING GRAPHICS:

The following list indicates the various kinds of materials and supplies that are good for making charts:

1. *Paper:* Butcher or other heavy wrapping paper or plastic-coated papers, are particularly good; also newsprint. Colored construction papers are fine for color accents, outlines, and silhouettes.

2. *Backing:* Bristol board, poster board, tag board, and similar materials are available in various grades; the price depends on the grade. For larger charts (over 30 x 40 inches) bracing is necessary; a light-surfaced building board is good for backing. Corrugated cardboard from cartons is another possibility.

3. *Adhesives:* Rubber cement and glue are always good. For some work, the newer colorless and stainless cements – e.g., model airplane cement – are particularly useful. Spray adhesives and double-faced masking tape are newer and more convenient adhesives for various purposes.

4. *Letters:* Many forms of lettering are available for use on graphics; lettering guides and several types of gummed letters on tape or sheets are two examples. Transfer or rub-off letters in various colors and sizes make it possible to do lettering of professional quality with a little practice.

5. *Tapes and Symbols:* Black or colored tapes are recommended for bars and wide lines. Gummed paper tape costs little, as do gummed symbols, such as arrows, circles, stars, etc.

6. *Pens:* Felt pens are handy and easy to use. Speedball pens, Payzant lettering pens (for extended lines), and India or other drawing ink are standard. Don't overlook heavy marking crayons and China marking pencils, particularly for temporary work. Among the better recent development are India ink fountain pens and a nylon tip felt pen with which fine lines and figures can be drawn.

7. *Shading (Texture) Sheets:* To help the user bypass extensive amounts of monotonous, repetitive drawing, adhesive-backed acetate sheets have been developed on which are printed repetitive opaque patterns. If the material is to be photographed, nonreflective matte finish is preferred. In some cases it is desirable to use these materials directly on transparencies.

   The great variety of patterns that can be obtained includes cross-hatch, stipple, diagonal lines, vertical lines, dot patterns, weaves, textures, and many others.

   With the shading sheet still on its backing, lay it in position over the area of the illustration to be shaded and being careful not to cut into the backing sheet, cut an area of the shading material slightly larger than the area to be shaded, peel the material from its backing. Place it over the drawing, lowering it onto the surface of the illustration (adhesive side down) so that air pockets and wrinkles do not form. Be sure to have a sharp cutting instrument. Carefully cut around the image and peel off the excess material. Press the shading material down for good adhesion.

   One variation involves shading and texture sheet material of the dry transfer variety. When using this material, you must remove the printed sheet from its backing and place it over the area of the visual that is to be shaded. When the surface of the sheet is burnished (rubbed) the printed pattern is transferred to the visual image. As the sheet is lifted from the visual, the printed pattern remains. Whenever shading and texture patterns are needed, these adhesive-backed printed sheets, and others, can save time, as well as furnish sharp, clean copy for a visual illustration.

Simplified Paste-Up Techniques

The term "paste-up" refers to art prepared in paste-up form specifically for any number of reproduction techniques (thermocopy, photocopy, electronic stencil copy; etc.). The true art of paste-up requires some professional know-how. However, an attempt has been made here to simplify the technique.

As a preliminary to the paste-up, it is a good idea to prepare a rough draft of what is intended to be the finished paste-up. This will help you visualize how the finished art will look and will serve as a guide in fitting all the art, lettering, shading, and so forth, together on the finished paste-up. The "rough" should be done on a sheet of paper the size of the finished art.

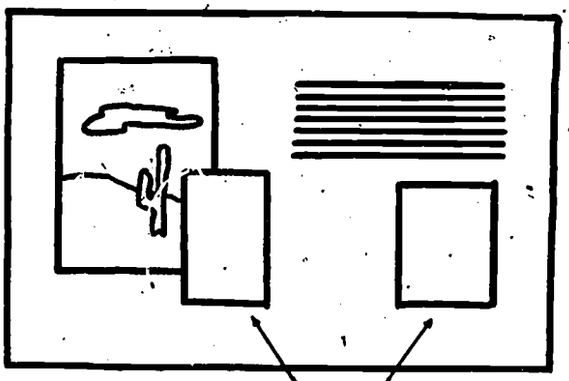
BASIC TOOLS AND MATERIALS:

There are several basic tools and materials required for paste-up. They should include a drawing board, T-square, triangle, cutting tools (such as scissors, razor blade, frisket knife), nonreproducing pencil, rubber cement, rubber cement eraser and correction material (liquid or paper). The nonreproducing pencil is for drawing any guidelines or marks on the

finished artwork which will not be sensitive to most reproducing techniques or methods. A light-blue pencil can also be used.

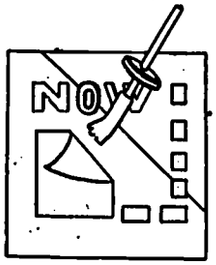
Instructions

1. Cut out the art with one of the cutting tools. Note that protective cardboard is being used to prevent cutting the next sheet in the clip art book.
2. Apply rubber cement to the reverse side of all paste-up art requiring adhesive. Next, apply cement to the areas on the working surface (paper, cardboard) where the art is to go. Allow both cemented surfaces to dry. The rubber cement should be thinned, 4 parts rubber cement to 1 part rubber cement thinner (solvent). This will allow the cement to flow freely from the brush.



Magazine Cutouts

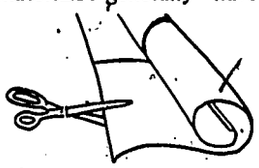
3. Attach the art to the working surface. Remove excessive cement from around the visual with a rubber cement eraser or rub off with a clean finger. Opaque out the cut line around the visual with white correction liquid.
4. Paste-up is ready for reproduction. Instructions for paste-up, related to a specific reproduction technique or method, should be followed very closely. What is presented here is only intended to be general instructions.



Selecting And Using Materials

IN THE GRAPHIC PROCESS

Audiovisual materials have been among the resources for teaching and learning in educational programs for many years. Most often, however, they have been secondary to verbal presentations by teachers, to textbooks, to the chalkboard, to library materials, and to other traditional and convenient methods of communication. Audiovisual materials generally have been considered as "aids" to instruction.



The mid 1950's have been established as the beginning of modern developments in instructional technology – that area of endeavor that has brought machines, materials and techniques together for educational purposes. Many of these developments have bearing upon presently emerging new instructional patterns and the roles of media to serve them.

One of the most influential media of communication is television, including both instructional (for direct classroom learning) and educational (for cultural and community enrichment). This medium is especially important for classroom utilization as such a wide variety of other AV instruments can be employed "on camera" so to speak.

The overhead projector, the slide and filmstrip projectors, the tape recorder, and associated materials, each have contributed in large measure to increased efficiency within the teaching-learning situation. The availability of these and other materials and instruments have made it possible for the teacher to use her own imagination and creativity in the production of materials for use in her own classroom. Recent emphasis upon local production of materials to offset rising costs, unavailability or unsuitability of commercially prepared materials has opened up a highly satisfactory and enjoyable vista for the teacher. She is limited only by her own imagination and resourcefulness.

Local production of materials has aided the current movement toward the individualization of instruction. Students differ greatly in their ability to perceive and learn, and in their individual requirements for learning. Some learn

easily and rapidly from printed or oral presentations, with a minimum of more "direct" experiences. Others require experiences that are more concrete, including the use of various avenues to learning. Some of the materials and processes common to many well equipped media centers are identified on the next page.

PROCESSES AND MATERIALS:

Slide series
- 2X2
- 3¼ x 4

Filmstrips
Tape recordings
Overhead transparencies
Motion Pictures
- 8mm
- 16mm

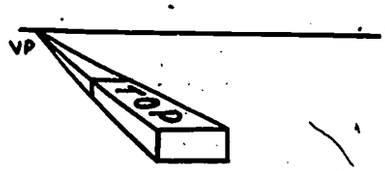
Television techniques
- Videotape
- Open & Closed Circuit

Recordings, disk
Transparency production
Dry mounting and laminating
Combined visual materials (multimedia)
Bulletin boards
Flannel boards
Cork boards
Hook and loop boards
Magnetic boards
Models, mock-ups
Mounting and filming study prints
Graphic productions (lettering, etc.)
Silkscreen printing
General art work
Duplication processes
Colorlifting (transfer) from magazines

SECTION II

Perspective Drawings

Perspective drawing is used to give a three-dimensional realistic effect to an object represented by graphic form. Parallel lines of an object are represented by lines that converge from the object to a pre-determined vanishing point on the horizon.

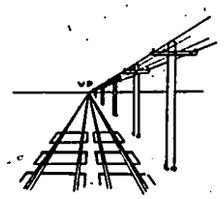


VANISHING POINT TO THE LEFT

While the horizon is considered, generally, as the eye level of the observer, the center of vision represents the position of the observer's eye. Each set of parallel planes has its own vanishing point, so a structure of complex planes may have several vanishing points.

In order to understand perspective, one may engage in several exercises. To see perspective at work, stand and look down a railroad track to see how the tracks tend to converge to a vanishing point. By standing at one end of a long building, the effect of the long perpendicular line near the viewer and the short vertical line at the opposite end of the building may be easily observed. Only when the dimension of perspective has been added to a drawing does it take on the aspect of realistic representation of objects easily identified in our environment. Perspective can be understood best through applying the principles of the center of vision, the horizon line, and the vanishing point to the observation of realistic objects.

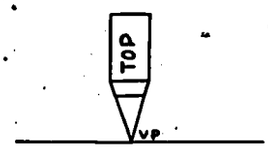
Perspective is a study that deals with the appearance of objects as in regard to their size and the direction of their lines seen at varying distances and from any point of view. The word objects here is used to include the surface of the earth, sea, and sky and all living things as well as those familiar forms that we call objects.



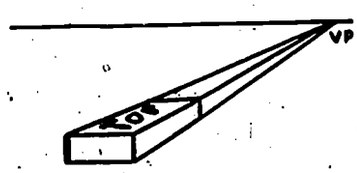
A very simple general rule related to receding parallel lines is the most important requisite to pictorial representation. The rule is stated as follows: "All receding parallel lines appear to meet in a point." As an illustration again, we consider an observation that most of us have made at one time or another. As we stand between the rails of a railroad track looking along them into the distance we notice that the rails – known to be parallel – actually appear to meet in a point on the horizon line.

This spot may be called the vanishing point. It is placed anywhere along an imaginary line which we will call the eyelevel, because that line is on the level with the eye as we look toward a scene. All horizontal lines in the picture will be parallel to one another, causing the junction between the horizontal and perpendicular line to form a right angle.

ONE-POINT PERSPECTIVE is based upon a focal point, toward which all lines showing distance in a picture recede.

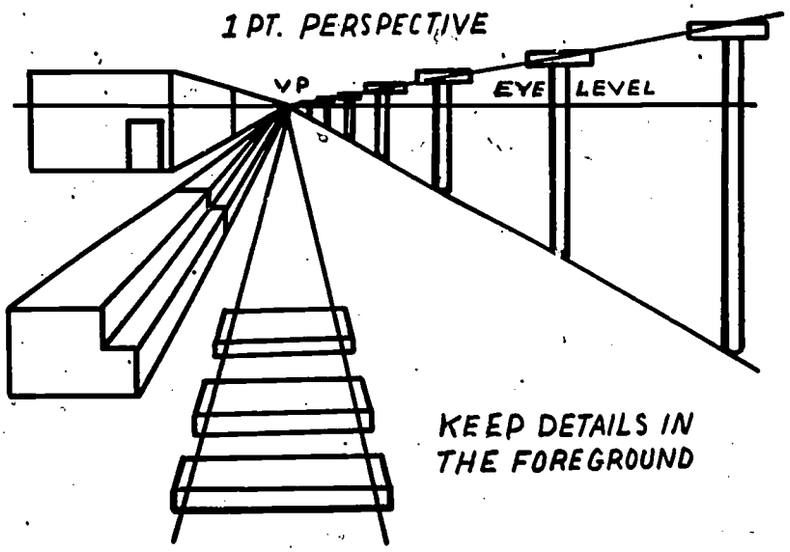


VANISHING POINT IN THE CENTER OF VISION



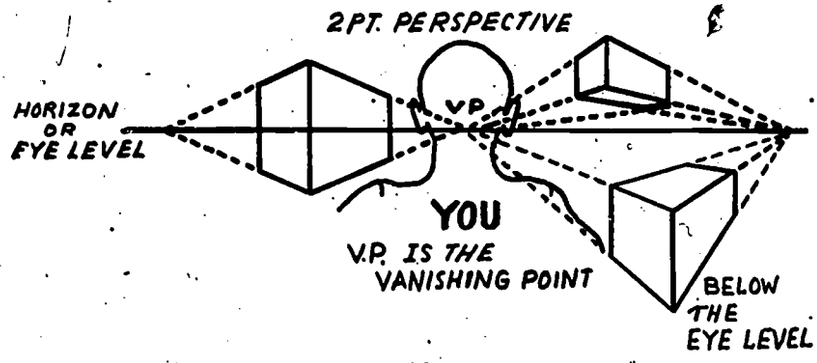
VANISHING POINT TO THE RIGHT

The receding lines will determine the size of the objects in the picture, those closer to the observer, of course will be larger and those farther back will become smaller and smaller until they disappear at the vanishing point.

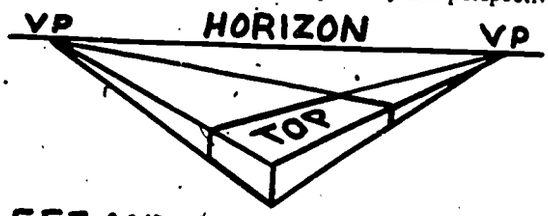


Here is another example of a one-point perspective illustration.

TWO-POINT PERSPECTIVE differs from one-point perspective in that there are two vanishing points at either end of the eyelevel. The front and sides of objects are determined by the receding lines. Lines of recession take place above and below the eyelevel.



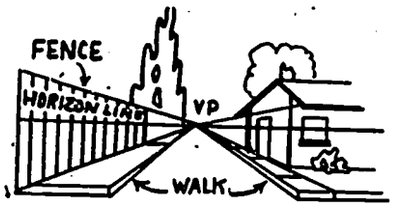
In views of real life, and therefore in realistic pictures, the eyelevel (horizon line) is rarely visible, and vanishing points virtually never are. Yet the significance of these concepts must be understood. Working with an awareness of them and actually sketching them in temporarily are perspective prerequisites.



LEFT AND RIGHT VANISHING POINTS

A basic knowledge of perspective is fundamental to any drawing or depiction of realistic objects. Though a poster may include a subject matter that evidences only slight depth, an awareness of the rules of perspective is vital to pictorial accuracy. It is one thing to work on a two-dimensional surface; but it is quite another to present the appearance of three dimensions. Thus, perspective sketches closely resemble photographs of objects.

It might be beneficial for the beginner to use a sharp pencil and some kind of straight edge device until that time when perspective comes a way of thinking.



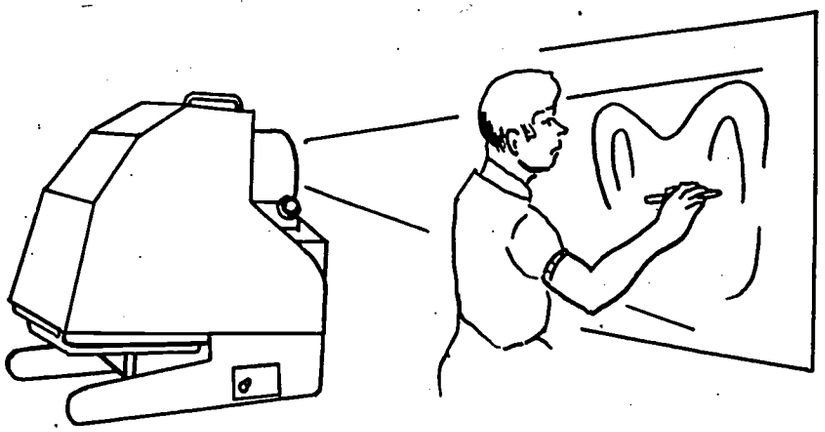
Perspective must not dominate the extent that the linear character of the design overwhelms the easy graduation of tone through-out the composition. Tone determines the unity and general character of the composition.

Illustrating

Changing the size of a visual: There are a number of machines, simple devices, and hard techniques which you might consider using to change the size of available diagrams. One is the opaque projector.

A small picture on a single sheet or in a book can be enlarged by using an opaque projector. Place the paper or book on the holder of the projector and attach a piece of cardboard to a wall. Adjust the size of the projected picture to fit the required area on the cardboard by moving the projector closer to the

cardboard (to be smaller) or away from the cardboard (to be larger) and focusing as necessary. Then trace the main lines of the projected picture with pencil. After completing the drawing, ink in the lines using pen and ink or a felt pen. This is one of the easiest and quickest ways to enlarge a picture.



TRACING:

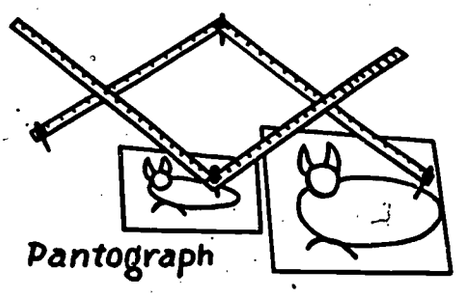
Same size reproductions are very easy to transfer. Standard typewriter carbon paper can do a creditable job. You don't have to write on the original if you cover it with a sheet of tracing paper before outlining. However, some may object to typewriter carbon since it does not erase easily.

If reversal is acceptable, just make a tracing of the original with a soft pencil. Tracing will be easier if you use a light box. Turn the tracing paper over so that the soft pencil drawing will contact the chart. Using care not to move the tracing paper, burnish the back of it wherever a soft pencil line appears. Enough graphite will be transferred to the chart to permit "inking in" later on.

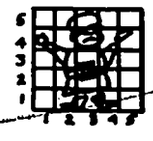
If reversal of the image is undesirable, and you don't want to use typewriter carbon paper due to difficulty of erasing, make your tracing as stated above, but instead of inverting the paper and burnishing, invert the tracing and rub a very soft pencil over the reverse side of the tracing. Take care to cover all essential lines, at least lightly. Blackening should be as complete as possible but it is not critical. Next place the tracing, blackened side down, on the chart and re-trace the tracing. Graphite will transfer from the blackened side to the chart. If you prefer commercial graphite, transfer paper may be purchased from any major art supply store.

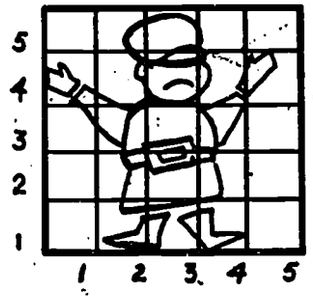
PANTOGRAPH:

A pantograph also may be used to enlarge or reduce pictures. It is operated by setting a fulcrum pin, tracing the lines of the picture with one point, and reproducing them in the desired proportion (larger or smaller) with a pen or pencil at another point.



By using the squaring method, a picture can be proportionally enlarged or reduced or even elongated and distorted purposefully. First prepare a grid on acetate or translucent tracing paper. The size of each square is determined by the size and detail in the picture (use at least 4 or 5 squares in length or width to cover the picture.) Then make a second grid with squares proportionally larger or smaller than the first one (for a double size enlargement the squares of the second grid should be twice the dimension of those of the first grid). Place the first grid over the picture and copy the relative position on each line onto a piece of translucent paper placed over the second grid. Lettering the border squares may help in maintaining the orientation.

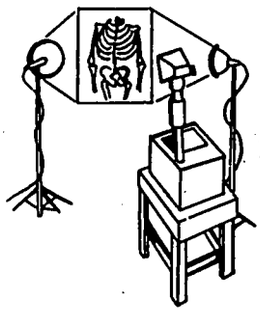




If you want to copy relatively higher or wider than the original, use rectangles instead of squares on your copy grid – tall or wide according to your wishes for the changed picture.

REVERSE PROJECTION:

Large pictures or posters can be reduced to fit 8½" x 11" or other formats. This technique uses the overhead projector in reverse fashion as compared to its normal enlarging use. The original, large diagram is attached to a wall and a light (floodlight or a slide projector) is aimed at it. Sufficient light must be reflected from the diagram through the lens of the projector to be visible on a white sheet of paper placed on the projection stage. Move the lens up and down to focus the image on the paper. Control the size by moving the whole projector closer to the wall or farther from it. Sketch the visual over the image on the sheet of paper.



Illuminated poster is mirrored through the lens of an overhead projector, bounced onto the stage of that projector where the image can be traced onto a piece of opaque paper.

SECTION III

Photography—Still

Still photographs used in the classroom are generally of three types: teacher or student made, prints obtained from commercial sources, or prints clipped from magazines.

The first type, photographs taken by the teacher, can be especially valuable instructionally. Student photographic essays on school subjects will provide class interest.

To begin shooting photographs, certain basic equipment will be needed. The most practical cameras are: the twin-lens reflex, the single lens reflex or the new "instamatic" type cameras. The twin lens reflex and the single lens reflex gives you approximately the same view as will appear on the film. Also, the camera

should be flash synchronized in order to take pictures indoors or outdoors when there is insufficient light.

The average snapshot, as printed by the local photographic store, is totally inadequate for classroom use. Enlargements from your pictures may tend to be costly if you have a great many prints made.

If you wish to go into black and white print enlarging yourself, you should obtain a copy of one of the many books available on printing.

PICTURE TIPS:

Hold Camera Steady; Watch Background; Get variety; Get Close.

Photography—Slides

Although the slide series has become a very popular way of documenting home activities, its use by classroom teachers has been quite limited. With the recent availability of semiautomatic cameras and automatic projection equipment the average teacher can literally bring the world into the classroom by means of the slide series.

EQUIPMENT:

Cameras are available in a wide range of types and prices. The 35mm camera when properly operated will produce photographic results of good quality. Essential features of suitable cameras are the following: (1) a method of focusing, (2) a shutter which will give a wide range of shutter speeds, and (3) a variable aperture or diaphragm. The 35mm cameras are the external viewfinder camera or the single lens reflex camera. A single lens reflex camera is the most desirable camera for the series slide maker.

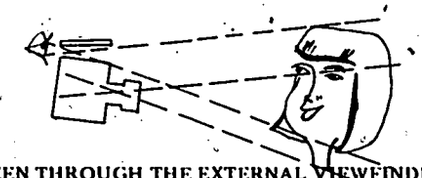


IMAGE AS SEEN THROUGH THE EXTERNAL VIEWFINDER CAMERA

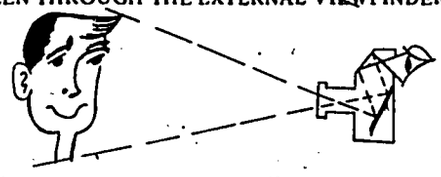


IMAGE AS SEEN THROUGH THE SINGLE LENS REFLEX CAMERA

The instant-loading camera is an inexpensive camera with the external viewfinder and fixed focus lens. With the addition of close-up lens attachments the camera will make satisfactory slides.

FILMS – Films are generally classified in two categories; those to be used in daylight or sunlight, and those which are to be used in artificial light, such as flood lamps and other types of incandescent lamps. Best results are obtained when a given film is used specifically for the purpose for which it was manufactured.

The single lens reflex camera makes it possible for the photographer to see the exact image in the viewfinder that is recorded on the film.

The difference in the object as seen through the finder in an external viewfinder camera and that recorded through the camera lens is known as parrallax. This condition is not serious when photographing an object at a distance of ten feet or more. At a distance of less than ten feet, the problem of parallax becomes increasingly acute.

EXPOSURE METER – To determine correct film exposures, exposure meters are necessary to measure the amount of light reflected or falling on the subject to be photographed. Incident light meters at the copy position will give satisfactory results. Use the exposure setting indicated in the instruction sheet for the type of light and filter (if any) recommended. If a reflected-light meter is used, make the reading from the camera position.

TRIPODS – Tripods are essential for holding a camera still for exposures of less than 1/25 of a second, for composing pictures, and for more than one exposure from identical locations. The tripod should be sturdy, adjustable in height, and equipped with heads which swivel in either the horizontal or vertical planes.

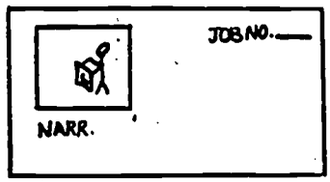
LIGHTS – When subjects are to be photographed indoors, it may be necessary to have a light source to supplement the normal room lighting. These light sources may be either the reflector flood lamp type or photoflood lamps in reflectors. It is advisable to have lamps which can be mounted on stands or clamped on tables, shelves.

STORY BOARDING:

Before making an 8mm movie, 16mm movie, slide series or filmstrip you must perform the most important step – PLANNING.

1. Write a short statement of your objective. (Do not try to take on too big a subject. Limit your film to a single subject or concept.)
2. List each procedure or point you want to include in the finished film in order to achieve your objective.
3. A standard 4 x 6 inch card should be made up for each individual slide or

scene. On the card is a place for numbering, some space for a description of the type of original, and space for instructions or text of the coinciding audio part of the presentation. A rough sketch of the visual can be drawn within the rectangle outline on the card. The story board with the cards in place shows at a glance the continuity of the sequence and how the narrative ties in with the visuals.



TITLING TECHNIQUES:

A slide show without titles is like a cake without frosting. Titles provide a finishing touch, answer questions, and help bridge gaps. Titles provide graphic explanations of the points you are trying to make. To make good titles, boil it down. The fewer words, the better. Use partial sentences. Eliminate "the's." Use nouns and action verbs. Avoid long, involved charts and sentences to be read by the lecturer.

As a rule of thumb, use letters, figures, or symbols which are no less than 1/25 of the total height of the material to be photographed. Double space between all lines.

Bold lettering in white or light colors makes good slides. Use cool or neutral colors for most titles – blues, greens, grays and rich blacks. Reserve bright reds, yellows and oranges for accents and important words.

Don't frame titles with straight lines. Keep straight horizontal or vertical lines away from the top, bottom and ends of your titles. Allow plenty of spare border. This is especially important with non-reflex cameras where you have to correct for parallax.

Acetate sheets with rub-on transfer letters create a neat, professional "printing" job. The acetate-sheet, letters in place, is placed over a color print or any other kind of background for photographing.

There are many ways to produce effective title artwork, even if you are not an artist. Usually one style is enough for titles in one program. Do not mix ceramic letter, typed letters, and rub-on letters all in one show or you will have hash.

Typewriters, especially electric ones with carbon ribbons, produce neat, black letters. You can type on colored paper, then cut the typed lines into strips and glue them on a dark-colored paper background.

To produce an effective slide series, you will need:

1. To determine the objectives.
2. To story board the slide series.
3. To produce your art work (Titles, Charts, Graphs, etc.).
4. To select the proper equipment.

5. To take the necessary picture and have film processed.
6. To evaluate the finished slides.

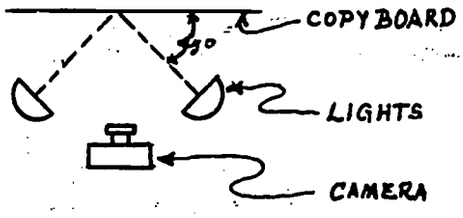
Photography—Copying

Once in a while every one wants to copy a picture photographically. This is a simple but exacting job, not easy unless you know just what to do. Everything about it is dictated by common sense, yet there are things a beginner is not likely to think of.

1. PLACING THE CAMERA: The camera must be rigidly supported. A good tripod will serve almost as well as a copy stand although it might not be quite as convenient. If you are using a copy stand, the copy is placed on the copy board which automatically insures that the film plane and copy are parallel to each other. The copy and film plane must be parallel no matter what method of copying is used. If you are copying with a tripod, the copy may be taped to the wall or laid on the floor. The camera is placed in front of or over the copy with the film plane parallel to the copy and the lens centered on the copy.

2. CAMERA: Any good camera that may be focused is suitable for copying. If the camera focuses only as close as two or three feet, auxiliary lenses must be used.

3. LIGHTING: The illumination for copying must be uniform over the entire copy with no reflections. The ideal placement of lights for copy work is at 45 to 60 degrees to the copy to be photographed, as shown in the drawing.



4. SIZE OF MATERIAL: For practical purposes the material to be copied should be a 3 to 4 proportion in both the horizontal and vertical directions. If extension or supplementary lenses are used, smaller areas may be brought into sharp focus to include the area of the entire frame.

5. EXPOSURE: The exposure is best obtained by using a light meter. Be sure the meter reading is the same at the edges of the copy as at the center.

The person that does not have a camera and is considering purchasing one to be used mainly for copying, would be wise to investigate the Kokak Visual Maker, which comes with a copy stand equipped with auxiliary lens.

Photography—Movie

16mm MOVIES:

The production of a film is basically the same for 16mm and 8mm films. The principal difference is in the equipment used.

The 16mm is usually a more sophisticated piece of equipment. There are more types of 16mm cameras available than for 8mm films. There are cameras for specialized work such as animation, aerial photography, and time lapse photography.

The 16mm film produces a larger image and has room for the optical sound tracks.

The high cost of 16mm equipment and film usually makes its use prohibitive.

8mm MOVIES:

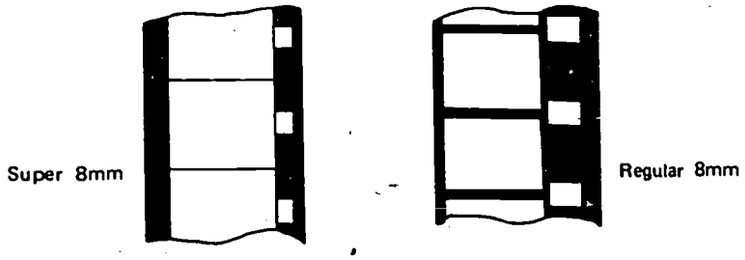
8mm instructional films are gaining popularity in classroom and laboratory as instructional media. Because of their versatility, they can be used alone or with other instructional techniques.

Many modern 8mm cameras have such features as normal, slow and fast motion adjustments, automatic exposure control, cartridge loading, single frame exposure control and through-the-lens reflex viewfinding. With such features, the beginning photographer can often produce professional films after a few trials.

Terminology, however, is often misleading. Super 8mm and single 8mm are basically the same except for the chemical composition of the film and the type of loading cartridge in which it is contained. The basic difference between super 8mm and regular 8mm films is the image size of each frame. Super and single 8mm have approximately 50 per cent more image area than regular 8mm film.

REGULAR OR STANDARD 8mm MOVIES:

Standard 8mm film was originally produced from 16mm film. This was accomplished by perforating both edges of the 16mm film and splitting it down the middle during processing. The result was a film 8mm wide with a single row of perforations along one edge. It was made to conform with 16mm characteristics (as to sprocket holes) and was not a design of its own.



SUPER 8mm OR SINGLE 8mm FILMS:

Because of its larger projected image Super 8mm films are favored over the regular 8mm films for classroom viewing.

Before the photographer begins producing the 8mm type films, the subject and length of the film should be considered. The amount of film used is critical and depends upon the method used in production. If a small closed-loop cartridge is going to be used, enough film can be packaged into it for approximately five (5) minutes or less of viewing.

The normal operating speed for the Super 8mm camera is 18 frames per second and slow motion at 24 frames per second. The running time for 50 feet of Super 8mm film is about 3 minutes and 20 seconds.

In selecting the subject it should be limited to a single idea or concept. It should be simple and direct, lasting only long enough to communicate the idea.

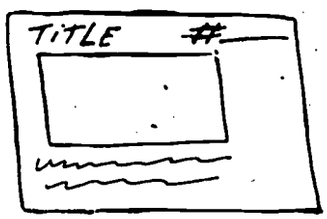
Planning is the most important step in producing any film. Adequate planning saves time and helps assure that all necessary details are included in your movie. It will contribute to logical exposition and can greatly reduce or even eliminate the necessity of editing the finished film.

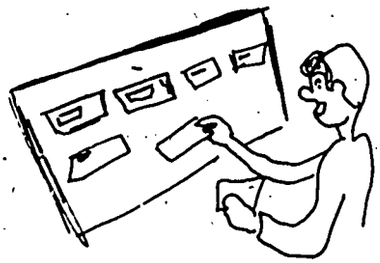
After selecting the topic for your film, list your objectives. What do you want the film to accomplish? What do you want it to say or show and what is the purpose of the film? You should write down the answers to these questions, then rewrite until your intent is so clear that there is no possibility of deviating. By that time you will have limited your subject enough to plan and write a story which will achieve your purpose.

Now you are ready to story board your film. A story board is a device that will hold a series of drawings arranged in a sequence to illustrate a story of situation. The individual drawings remain free to be positioned and studied simultaneously whenever necessary. Storyboards ususlly contain rather crude drawings that are intended to convey an idea rather than display any artistic merit. Use an index card for each visual idea you plan to show in your movie. Or one card for each shot.

Use the lower part of the card to write in the summary of the shot's purpose. Use the upper left portion of the card to sketch in what you plan

to shoot in that scene. Reserve the upper right corner to note the camera location, type of shot – long shot, medium, etc. and approximate length of the scene.



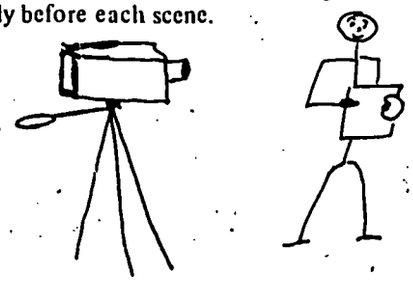


When your planning cards are arranged satisfactorily, number them so you will always have them in the right order.

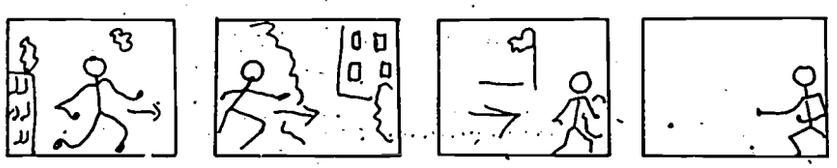
After completing the storyboard, you should determine what film you will need for the camera you have selected. Since you will probably be working with an 8mm size, your selection will be limited to the amateur film available. Although 8mm sizes do not have a wide array of emulsions and speeds which are available to the professional in 16mm sizes, the film should be quite satisfactory. Unless there is a reason for using black-and-white film, try shooting in color.

A few simple rules can help to conserve film, time, and make your shooting easier:

1. Follow the instructions found with every camera and every roll of film.
2. Take heed of your lighting conditions. Most color film is balanced for either artificial light of various types or for daylight (at noon plus or minus two hours). Use a good exposure meter if your camera does not have an electric eye lens diaphragm. Light levels are most difficult for even a professional to approximate.
3. Keep your lens clean using a lintless cloth or a lens tissue. Do not use silicone impregnated eyeglass lens tissue, as the silicone may destroy the lens coating.
4. Make certain the drive battery is in good condition before shooting. If the camera is a winding type, wind it fully before each scene.
5. Keep the camera steady. If you can mount it on a sturdy tripod, do so. Most of the "bouncing" so characteristic of amateur work, is due to hand-held cameras.



6. Take your time! Unless you are going in for subliminal instruction, plan to have your subject on the scene long enough for it to have the desired effect on the viewer. If a title is the subject, two or three seconds might be enough; but if it is an action scene involving people, animals, or mechanical movement – eight to ten seconds is generally regarded as a minimum. No absolute guides are possible; scene length depends on your intended effect. It is possible to shoot a scene too long, but this is seldom the hallmark of the beginner!
7. When your scene involves rapid action, shoot them at about a 30 degree angle, with the action moving toward the camera. Pictures of action moving laterally past the camera lens, end up as a sideways smear when projected.
8. Avoid "panning." Moving the camera laterally to get a sweeping view of an essential non-motion scene should be left to the professional. The effect is quite similar to that suggested in No. 7 above, except that in too rapid panning the whole scene is blurred, not merely the moving object.
9. When taking outdoor pictures, don't let the sun shine into your camera lens. Light should be on the action, not the camera. Pictures taken with the sun shining into the camera (or at the rear of the subject) invariably result in overexposure or in heavily backlighted subjects which appear as mere silhouettes.
10. Use variations from normal speed only when absolutely necessary. Film should generally be shot at the same speed at which it will be projected. (16 frames for double 8 and 16mm silent; 18 frames for Super 8 silent, 24 frames for 8 and 16mm sound)
11. Vary the size of the screen image. Open your scenes with a long shot to establish the scene; then move in for a closeup to show detail. The long shot introduces the locale – it is the orienting or establishing shot. The medium shots gets us fairly close to the subject, but the close-up is more intimate; we are right in there and can identify with the subject.
12. Vary the camera angle. Cross over to the right or left of subject, between shots. This is another way of varying the look of the image on the screen. It also makes the continuity of any bit of action appear to be smoother.



13. Continuity. Make each scene relate to the next one. This is one way to get motion into movies. Shoot clean exits and entrances at the end and beginning of scenes, where possible.

14. Screen direction. If an object is moving from left to right on the screen, we usually assume that it will continue in that direction after it makes an exit. If an object is suddenly found traveling in a reverse direction, confusion will result unless we have: (a) actually shot the object making a turn and backtracking, or (b) shot it going straight toward or away from the camera.

EDITING THE FILM:

After your film has been processed by a commercial laboratory, the next task you face is editing. Seldom will anyone "shoot" a length of film which has no poorly photographed, poorly acted, or improperly timed sequences. You may have to delete parts which, upon viewing, seem out of place in the production. Regardless of the reason, editing is always needed.

An essential piece of equipment in proper editing is an "action editor," a device which shows you your film as it will appear when projected, and allows you to stop whenever you need to cut or splice film sections.

The teacher who shoots and edits his own film has a problem. Pride of authorship often causes a sequence to be included when almost any independent editor would have let it drop to the cutting room floor! With this caution firmly in mind, you are ready to splice.

There are two kinds of splices which you will use — "butt" and "overlap." If your film is used in a cartridge projector or some automatic loaders, butt splices must be used. If it is one of the new polyester base plastics, butt splices are essential. If it is not in either of these categories, the overlap splice will generally suffice.

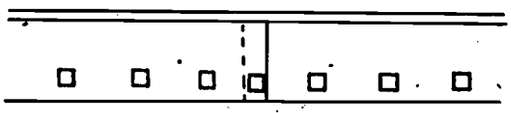


Fig. A

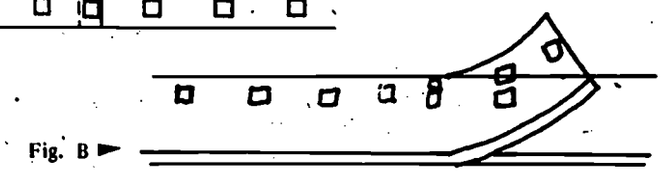


Fig. B ►

To make the overlap splice, (Figure A) the film ends are precisely cut, but about 1/8 inch overlap is provided. The emulsion is scraped from one side of the film to be spliced, and the other side is roughened. Film cement is applied to the overlap, and the splice is clamped together until the bond becomes secure.

In butt splicing, (Figure B) the two pieces of film to be joined are precisely cut so they match, or butt, each other, while aligning perfectly with the sprockets on the splicer. The special splicing tape is then applied, then burnished down to complete the splice.

Photosketching

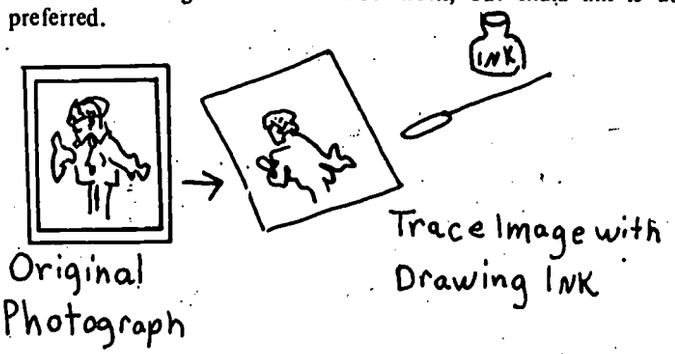
The purpose of photosketching is to create a high contrast drawing (black drawing on white paper) of high quality by people who may not be talented in art.

Prodedure:

Step 1. Photograph the object, scene, or action that is desired in the drawing. For example, to obtain a drawing for the May Day program, photograph children around the May Pole.

Step 2. Process the film as usual and make a print.

Step 3. With India ink, sketch over the portion of the picture that is desired for the final drawing. Pencil will also work, but India ink is usually preferred.



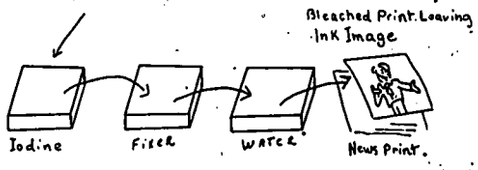
Step 4. Put 1 oz. of Tincture of Iodine into 2 oz. of water in a glass, enamel or stainless steel tray. (Some prefer to use less water for faster fading of picture)

Step 5. Put about 8 oz. of fixer in a flat tray. (Photographic Fixer F–5, F–6, or F–7)

Step 6. Place sketched print into the Tincture of Iodine solution for about three minutes.

Step 7. Then take the print out of the Tincture of Iodine solution and place in the fixer until the iodine stain and the photographic image is completely bleached out.

Step 8. Dry the print between newsprint or blotter paper.



Step 9. The resulting India Ink drawing on white paper can then be copied and duplicated for various purposes. By photographing the drawing, the image may be increased or decreased in size to fit any predetermined need.

SECTION IV
Lettering

To be most effective, displays, transparencies, charts, graphs, bulletin boards, and other visual materials often must be accompanied by verbal explanations. Lettering quality and the legibility of accompanying labels and captions can add to or detract from the effectiveness of any display, and thus facilitate or limit learning from instructional materials.

Here are some suggestions which teachers should keep in mind when lettering instructional materials:

1. Keep labels and captions short and simple.

2. Don't use fancy letters; use a style that is easy to read.

3. Use a uniform height in lettering materials.

4. Spacing of letters should be done optically. Equal measured distances between all letters do not look equal. Make spaces look equal, regardless of measurement.

CAPITOL – Optical Spacing

Measured Spacing – CAPITOL

5. Be sure captions can be read from a distance when used on the display. For display materials follow these recommendations:

Maximum anticipated viewing distance	Minimum letter height (lower-case letter m)
8 feet	1/4 inch
16 feet	1/2 inch
32 feet	1 inch
64 feet	2 inches

Capital letters, alone or with lower-case, should be correspondingly larger because they are less legible.

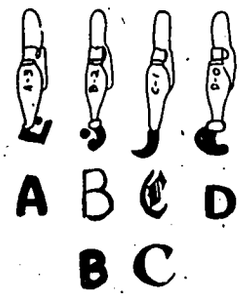
Teachers should attempt to become more aware of various lettering devices and techniques which will help teaching materials better convey ideas and concepts to their students. Good lettering is an essential in making effective transparencies and posters as it is in display advertising for the print or television media.

Time and effort will be minimized by using the size and style of pen, brush, guide or device which will form the different letters of any given alphabet without subsequent remodeling of the strokes necessary to shape the letter.

Consider the use of the following pens for hand lettering:

1. Speedball pens, the most common for hand lettering.

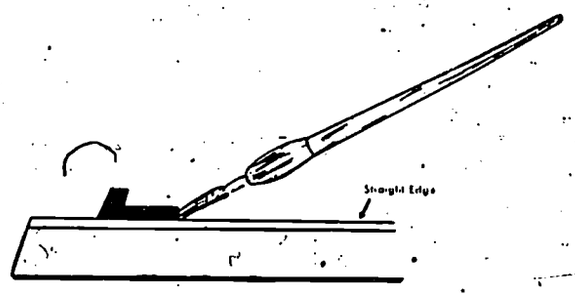
SPEEDBALL



Lettering pen nibs of different sizes and shapes make possible many types of letters.

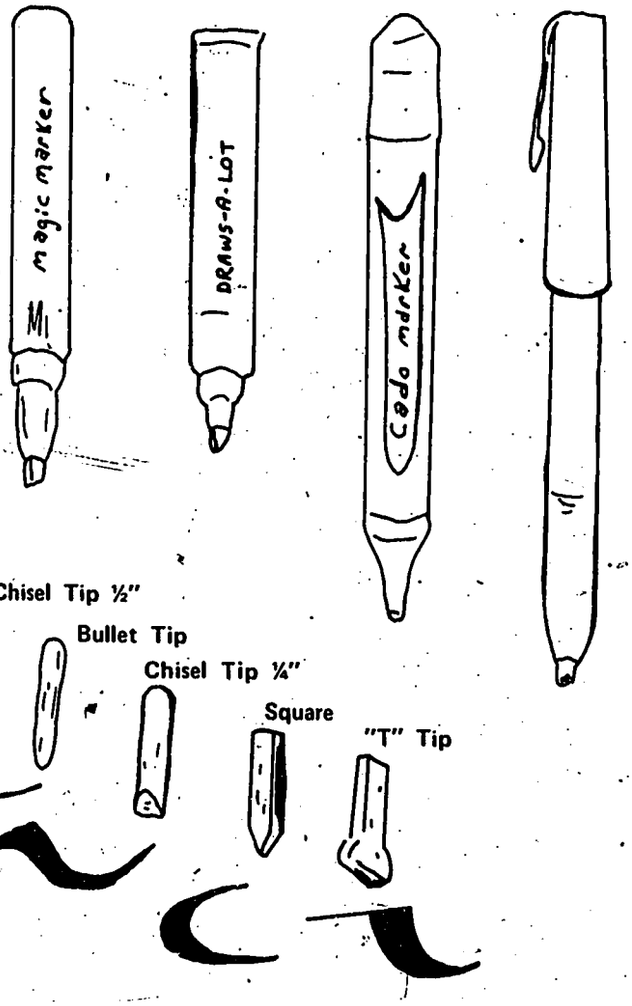
2. Brush or Duckbill pens, for lettering of signs and posters. Broad strokes make possible single stroke lettering. A metal-edge ruler is used as a guide for making straight edges.

DUCK-BILL STEEL-BRUSH PENS

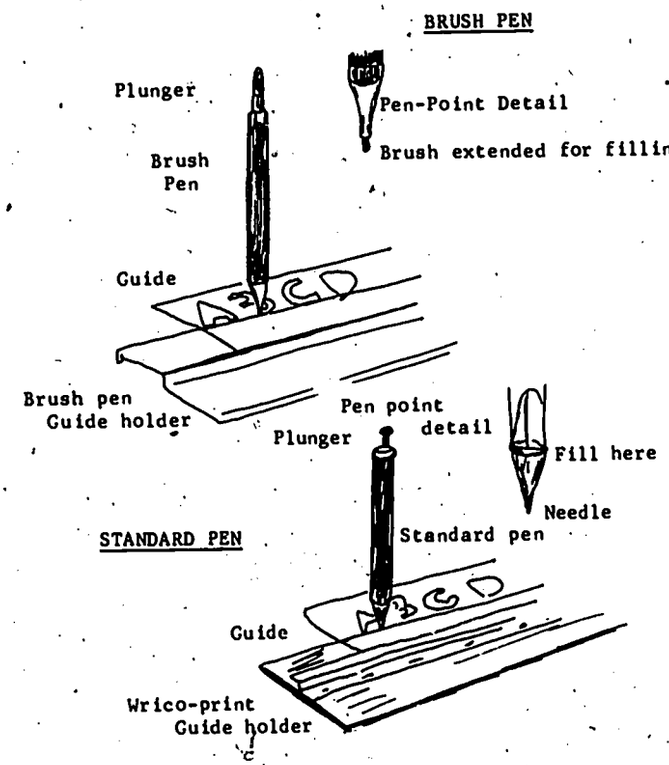


3. Felt or nylon tip pens, for rapid lettering or drawing on paper, wood, glass, metal, cloth, or plastic. Pens have interchangeable tips in a variety of shapes. A variety of brilliant colored inks are available commercially for use on paper and plastic surfaces.

FELT TIP PENS



4. Wrico lettering pens and guides. Ink flow is adjusted to suit different lettering surfaces by plunger and needle to point. Points are interchangeable.



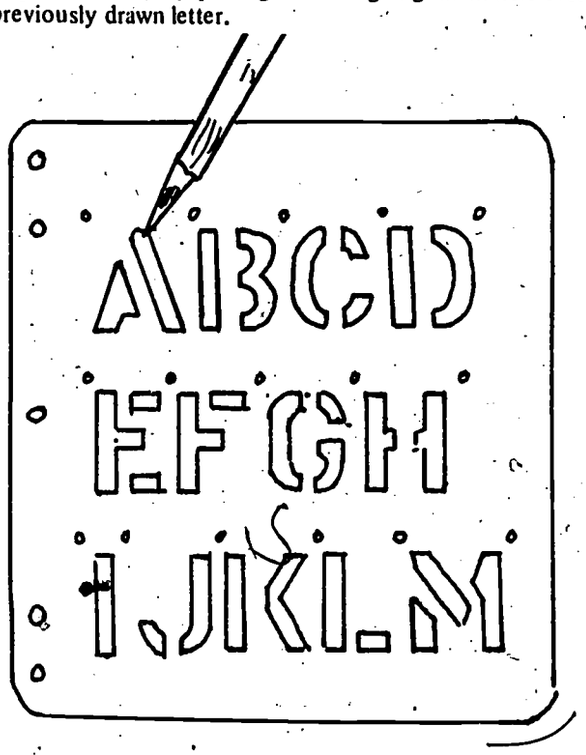
Pen is filled through opening in side of ferrule. Pen must be held vertical when used. Wrico brush pen, designed for use with large size lettering guides and guide holders. Produces lines which are full and solid without excess of ink or color. Pen sizes from 1/16th" to 1/4". Wrico guides are designed so that letters are drawn by tracing the opening in the guide with a lettering pen after lining up the guide against a T-square or straight edge.

Standard lettering stencils are die cut into a tough oiled or wax paper stock. They are usually inexpensive, durable and easy to use for making attractive letters for charts, posters, and other materials. They are available in letter size from ½" to 8" in Gothic, Roman, and Old English, both upper and lower case.

Stencils and stencil brushes are used along with locally produced or commercially prepared templates. Letter outlines are often done through openings in the stencil directly on the display material with a pencil and later filled in with a brush, felt-tipped pen, or other coloring device.

Paper stencil systems usually provide some means of lettering, spacing, and

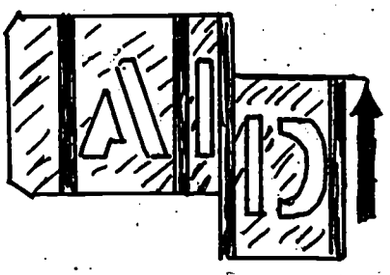
alignment since the user cannot see through the stencil to judge for himself. Stenso lettering stencils use the line-dot system. A straight line is drawn in pencil on the surface to be lettered. The stencil is aligned so that the two holes just above the desired letter falls on the drawn line. A dot is placed in each hole, and the succeeding letter is spaced merely by placing its leading alignment hole over the trailing dot of the previously drawn letter.



Letters should be outlined lightly, in pencil. When the stencil is removed, letters should be "touched up" at appropriate points to avoid letting the finished product have a "stencilled look." These stencils can not be used directly with liquid inks.

Metal interlocking stencils are available which are especially useful when words are to be repeatedly used in lettering a chart or several charts. Words can be made up and used over and over, then easily taken apart when they are no longer needed. Care must be taken when using paints and inks with metal guides for some inks tend to run under the metal stencils. Quick-drying inks and thick paints work best when using metal guides; paints should be applied with quick, dabbing motions.

When die cut stencils are used, the "stenciled look" may be avoided by filling in wherever appropriate.

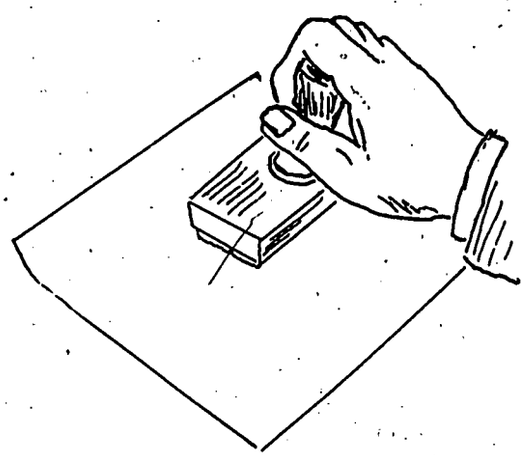


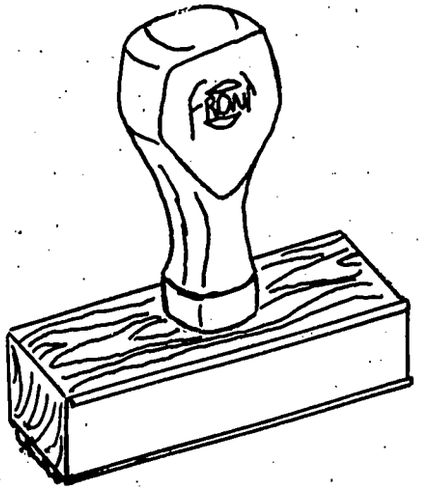
Some lettering guides (stencil type) are made of transparent plastic, and are either undercut or raised above the writing surface.

In this way, the guide can be moved laterally to form successive letters without smearing undried ink. Plastic guides of various manufacturers will produce letters from about 3/16" to 4" high. In the wrico system a special long nib felt pen is used. The pen itself is essential since the guide is only 1/4" above the paper during use. Letter spacing is left to individual judgment since the guide is transparent. Alignment is achieved by placing the guide against a specially grooved straight edge, which is cork backed to prevent slippage during use. Different colors may be used, but you'll need a different felt pen for each color.

In using the Wrico system of lettering, success will depend on your ability to keep the pen moving or off your paper. Since the ink has a tendency to saturate the paper, letting the pen rest on the paper too long in any one spot can cause seepage and result in unsightly letters.

Smaller lettering is often needed, especially on charts, graphs, and papers. A standard reservoir lettering pen and plastic lettering guides can be used by even a beginner to make professional results. Drawing ink is placed in the furrule reservoir with a dropper. A needle and plunger inside the pen are used both to keep the ink channel to the point open, and to raise the pen off the paper without smudging. Letter width up to about 3/16" can be achieved with this standard lettering pen. Plastic stencil guides must be matched to the nib size of the pen. Stencils are undercut to prevent flow of ink under the stencil.



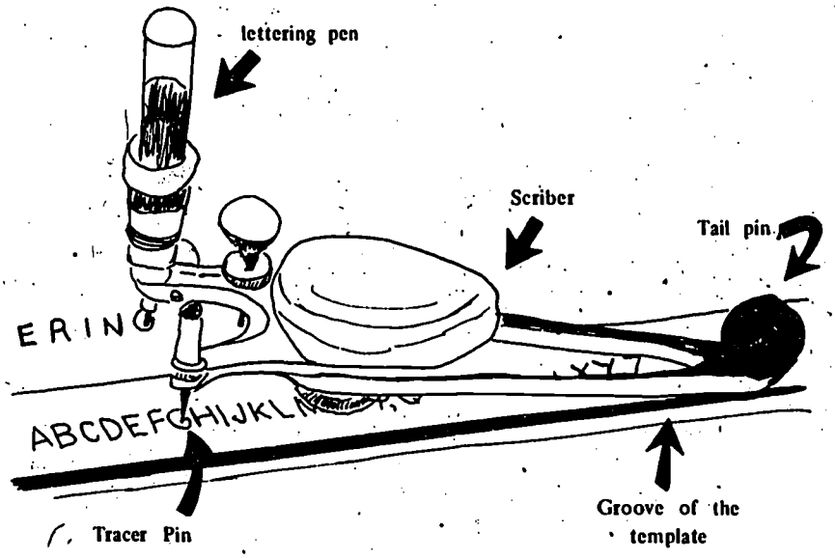


Rubber stamps are another means of lettering. They are available in a number of sizes and styles that are both economical and easy to use. Vertical

guides may be obtained to insure that letters are kept straight and vertical. The guide slides along a ruler or other straight edge.

Mechanical lettering systems consist of a pen, template, and a scriber. Pens are designed to fit in the scriber and the ink flow is regulated by a needle in the center of the pen.

1. Set the template against a T-square (taped to the working surface).
2. Set the pen firmly into the hole in the scriber arm and tighten the screw on the side.



3. Fill the pen with two or three drops of ink.
4. Choose the template with the size and style of lettering you want. Lay it along your straight edge. Also choose the type of pen you need with the width that best suits the job you are doing.
5. Set the tail pin of the scriber in the straight groove of the template. With the tracer pin of the scriber simply trace the engraved letters on the template. The pen reproduces the letter or symbol in full view, above the template.

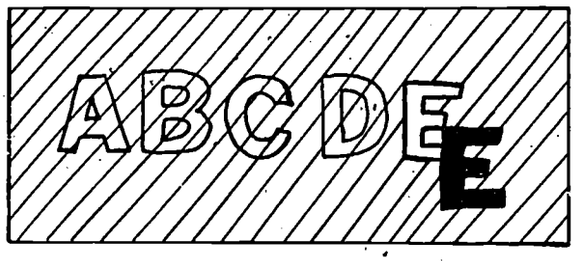
The following additional details are useful in proper lettering:

* Judge letter spacing by eye, according to what looks correct.
* Start ink flowing by stroking the pen on scrap paper.
* Adjust the vertical screw on the scriber, just behind the pen, so it touches the paper lightly to permit a steady flow of ink from the pen while lettering.
* Start near the center of a stroke and work to the ends. Keep the pen moving to eliminate the globs of ink that collect and fatten ends of strokes and other places where the pen pauses.
* When you complete using your pen, remove it from the scriber, separate it and wash the pen.
* Some scribers are adjustable. A screw on the underside can be loosened and the two arms spread apart. This permits making slanting letters of various degrees.
* Larger size templated (approximately size 500 or larger) require the use of a different scriber.

PRE-CUT AND DIE-CUT LETTERS:

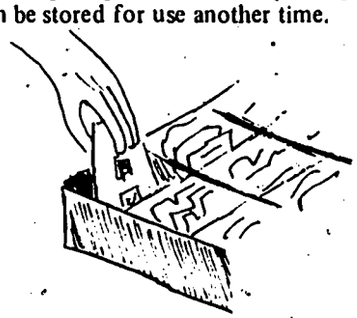
A very attractive and eye-catching system of lettering involves the use of die-cut, pre-cut, and three-dimensional letters. These letters are manufactured in wood, ceramic, paper, cardboard, glass, and plastic and range in price from a few cents per letter for the single usage type to several hundred dollars for the sets of reusable letters.

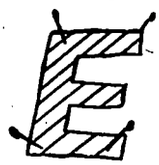
The most inexpensive type of letter is the paper type which has no adhesive backing. These letters are pre-punched out of construction paper so that the user only has to snap them out. The letters are then ready to use and are available in many styles, colors, and sizes. They are easy to manipulate and are satisfactory for bold titles, and can be placed over any background.



Other letters are punched out of cardboard or other material and packed in sets containing individual compartments. These letters may be

glued, dry mounted, or put up with thumb tacks or pins. If tacks or pins are used, the letters can be stored for use another time.





There are some companies making paper letters which have an adhesive backing. These, of course, cost more money since they are usually from a better grade of paper. But their use results in a very professional looking chart or poster. It should be noted here that use of pre-cut stick-on lettering is so easy, many users do not exercise caution in doing the layout.

USING PRE-CUT OR DIE-CUT LETTERING:

1. Draw a light guide line with a pencil.
2. Select the letters to be used.
3. If letters are adhesive backed, wet a towel or sponge and moisten the reverse side of the letter.
4. Carefully position the letter on the poster on top of the guide line.
5. Press the letter firmly into position with a tissue or handkerchief.
6. Allow the letter to dry completely and evenly.
7. Erase the guide line.

The "jumble" method is an attractive and easy way to layout a line of pre-cut lettering. No straight line is necessary – just place the letters so that an eye-catching or esthetically pleasing arrangement is made.

Shadow effects can be obtained with these letters. For example, by placing a white letter on a piece of cardboard and then off-setting a black letter over it, you would get a startling shadow effect.

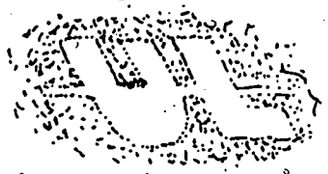
SPRAY LETTERING:

Probably the fastest, simplest, and most eye-catching method of lettering is that of spray lettering. This type of lettering can be as simple or involved as one's imagination will allow him to become.

In order to make letters by spraying, a font of heavy letters is required because after several coats of paint on thin letters, they will begin to warp

or even curl. The thick (1/4") letters are by far the easiest to use and will not warp with repeated use and will be heavy enough to lie flat on material to be lettered. If the letters are not heavy enough to lie flat, the pressurized paint or stencil ink from the spray can could blow them out of line.

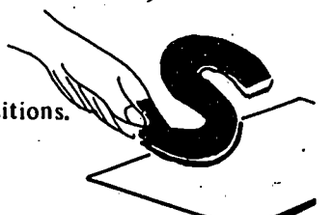
Medium thin letters may be used by placing weights on them before spraying, or by using a piece of welding rod. The disadvantage of the rod is that the rod tends to leave an unpainted line through the letters.



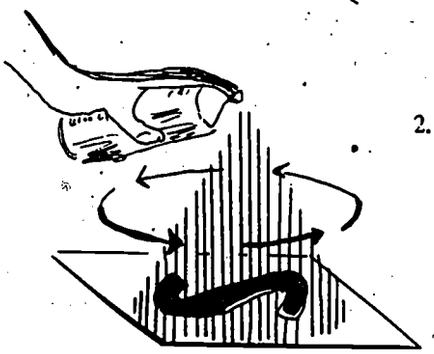
Several companies have such heavy letters on the market (e.g. Upson, Hallcraft, etc.) They come in a wide variety of sizes and styles and are relatively inexpensive. There are many kinds of spray paints available for this kind of lettering. Among the most useful are fast drying lacquers and stencil inks. These are sold under different brand names, but may be found in most hardware and department stores. However, any spray paint will work.

It is important to line the letters with a ruler for a professionally finished product. Areas of the poster where spray paint is not desired may be masked off with pieces of cardboard or paper, weighted down with small flat stones or lead wieght.

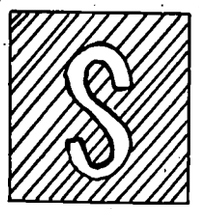
DIRECTIONS FOR LETTERING WITH SPRAY:



1. Arrange the letter or letters in the desired positions.



2. Hold the can in a near horizontal position, spray from 10-12 inches above the letters, moving the can slowly from left to right, top to bottom.



3. Allow the paint to dry, remove the letters and return them to their storage containers.

4. Turn spray paint can up side down and depress the nozzel until the spray clears. This removes the paint from the nozzle and prevents from clogging.

POINTS TO REMEMBER IN SPRAY LETTERING:

Two or three light coatings of paint are better than one heavy coating.

Spraying should be done with work on a flat surface in a flat position.

Allow spraying to DRY THOROUGHLY before returning letters to containers, otherwise the letters may stick together, ruining the set.

Laminating over spray letters is not necessary, as this system is usually considered a quick, temporary means of production.

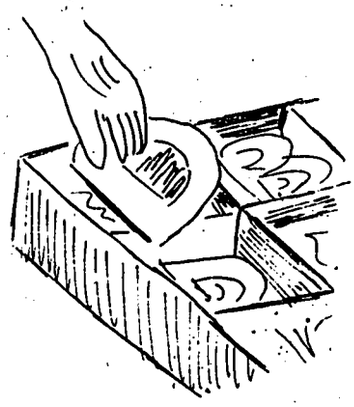
Spray in a WELL VENTILATED AREA.

STORAGE OF LETTERS USED FOR SPRAY LETTERING:

Though spray letters are quite sturdy, they should be stored properly. The major advantage of a good storage arrangement is to facilitate their usage. Good storage is also necessary to protect the letters from warping.

A good way to store them is in a strong cardboard box with compartments. This way the letters will lay flat.

Another way to store them is to stand them upright if space is a problem.



LETTERING – PLASTER LETTERS

Plaster-lettering sets may be easily constructed by any teacher, and are especially useful when three-dimensional letters are needed for bulletin board displays and other instructional materials. With proper care, plaster letters will give years of useful service.

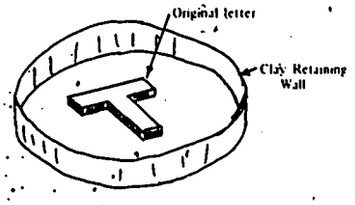
MATERIALS AND EQUIPMENT:

Casting plaster	original 3-dimensional letter
Bowl or cup	small nails or brads
Spoon for stirring plaster	sandpaper
Vaseline	tempera paint (powdered)
oil-base modeling clay	

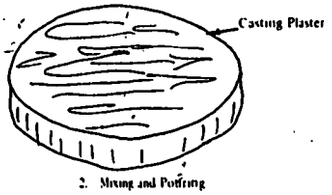
PROCEDURE:

Coat the letter to be duplicated with vaseline and place FACE UP on a flat working surface. Then:

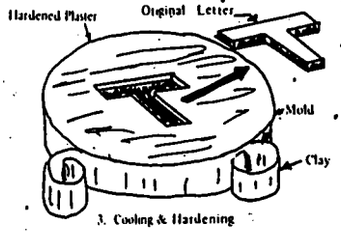
1. Build a clay retaining wall approximately 1 inch from the outer edge of the letter and 1 inch higher than the letter is thick.
2. Mix the plaster until a creamy consistency is achieved; then, pour the plaster over the letter within the retaining wall.
3. Allow the plaster to harden and cool. After the plaster is cool, remove the clay retaining wall, turn the hardened plaster over, and remove the original letter from the cast. The mold is now ready to use.
4. Coat the interior of the mold with Vaseline. Mix the plaster, and pour slowly into the mold. (Colored letters may be produced by mixing powdered tempera paint with the plaster before pouring.) Remove any bubbles that may form by stirring the plaster immediately after pouring, or by pulling bubbles off with a medicine dropper.
   Nails or brads to hold the plaster letters in place on a bulletin board should be inserted into the plaster head first after the plaster begins to set, or harden.
5. After the plaster has hardened and cooled, remove the duplicated letter from the mold, and sand off any rough edges. The letter is now ready for use.



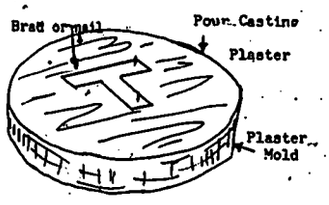
1. Retaining Wall



2. Mixing and Pouring

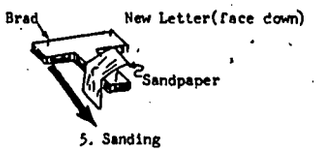


3. Cooling & Hardening



4. Mixing and Pouring (2)

Dry-Mounting



To save time, a gang mold can be made to speed up the production process. Simply coat several letters with Vaseline, lay them face down on a flat surface, build a clay retaining wall around all of them, and continue with the duplication process in much the same way as outlined for the production of an individual letter.

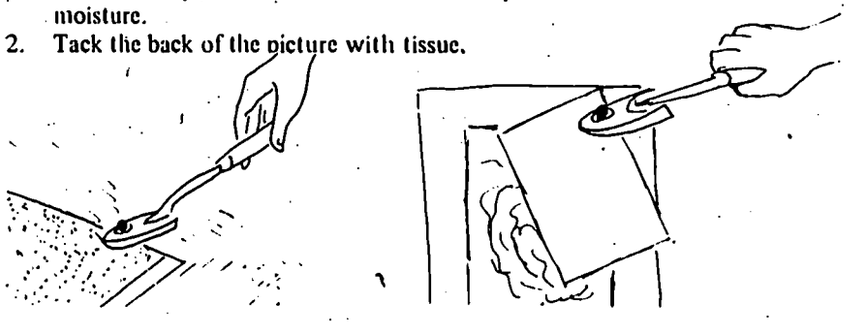
SECTION V

Dry-Mounting

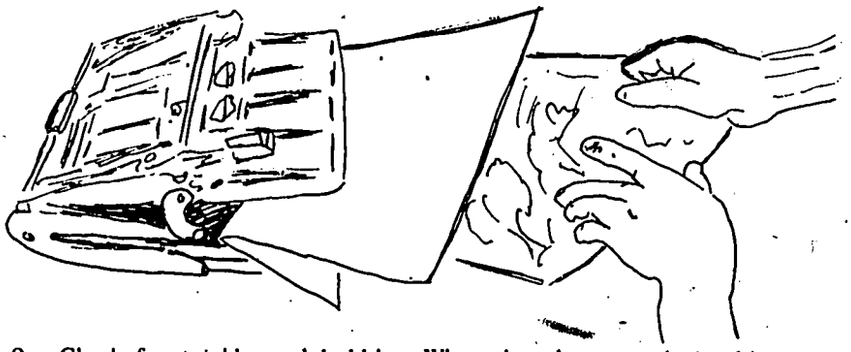
Flat pictures and cloth articles are often mounted by the "dry" method. Dry mounting is usually done in a special heated laminating press, but it may be accomplished using an ordinary household clothes iron.

DRY-MOUNTING WITH A PRESS:

1. Preheat the picture and cardboard in the press for 10 seconds to remove moisture.
2. Tack the back of the picture with tissue.



3. Trim picture and tissue together on all sides.
4. Tack picture and tissue to mounting board in two corners.
5. Cover the picture with a clean sheet of thin paper and put this in the press.
6. Press must be pre-heated and thermostat set on 225 degrees.
7. Seal the picture in the press for 5-15 seconds.
8. Cool the mounted picture under a metal weight.

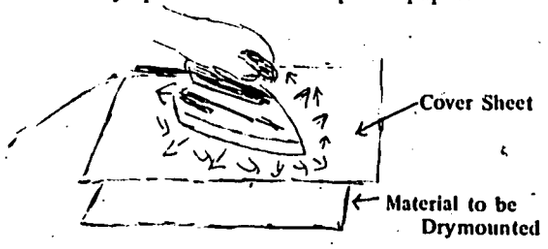


9. Check for wrinkles and bubbles. When they do occur the problem can usually be corrected by placing the material back into the press for a short period of time.

NOTE: When using a dry mount press, all materials go in the press on top of the masonite board, between layers of brown paper!

DRY-MOUNTING WITH A HAND IRON:

1. Prepare a working area(the top of a formica counter will do, or use a piece of hard board.)
2. Set the iron on "Silk" setting.
3. Preheat both the picture and cardboard for 10 seconds to remove any moisture from them. (This is to help prevent wrinkles and bubbles.)
4. Adhere the dry-mount tissue to the back of the picture, but tacking it in several places. Remember to always protect the table top with paper.



5. Trim the picture and the tissue together on all sides.
6. Align the picture on the cardboard.
7. Tack the tissue to the cardboard in two corners.
8. Cover the picture with a clean sheet of thin paper. Seal the picture to the cardboard, working from center to the edges.
9. Cool the mounted picture under a metal weight.

CONSIDER THESE ADDITIONAL DETAILS WHEN DRY-MOUNTING WITH THE HAND-IRON OR WITH THE DRY-MOUNT PRESS:

If more than one sheet of tissue must be used, butt the edges together; do not overlap them.

If a mounting is too large to be sealed in the dry-mount press at one time, seal it in sections. Make sure successive areas in the press are overlapped so none of the picture is missed.

When using the hand iron, there is a tendency to move the iron quickly across the paper, covering the picture. Properly, a moderate amount of pressure should be exerted with the iron and it should be used from the center of the picture outwards with slow movements, so all parts receive heat and pressure for about five seconds.

When pressing is complete, place the mount quickly under a weight for cooling. This is when actual sealing takes place. A metal weight, which absorbs heat quickly, is preferred.

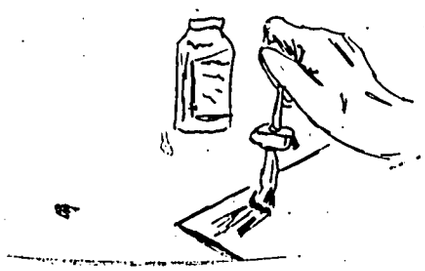
Wet-Mounting

Wet-mounting is a simple procedure that requires no special equipment to accomplish temporary mountings. Wet-mounting is very useful for making paste-ups for line drawings.

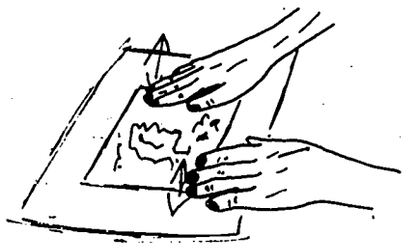
In wet-mounting, the entire reverse side of the picture is coated evenly with a liquid adhesive (paste, glue, or liquid cement), usually by brushing. Ordinary wallpaper paste may be used, but it has been found that adhesives especially designed for wet-mounting give better results.

Here are some steps to remember when wet-mounting:

1. Trim the material to be mounted.



2. With a liquid adhesive, coat the back of each piece to be mounted.
3. Place the coated pieces down on the cardboard. While the pieces are wet, they can still be moved as necessary to get the exact position and alignment.
4. Using your hands, smooth the picture that is being mounted. This is to



remove all wrinkles and assure a good bond between the picture and mounting board.

5. Allow the adhesive to dry completely before using the paste-up.

The key to wet-mounting by the amateur is in the thickness of the picture being mounted. If the illustration or photography is on fairly heavy stock, wet-mounting is simple. The thinner the stock, the more difficulty you will encounter. This is because most thin papers have a tendency to curl when a wet adhesive is applied. This will, of course, make them hard to handle.

When wet-mounting a magazine illustration or any other picture of fairly thin, absorbent paper, it is best to coat the reverse side of the picture with a clear acrylic spray before applying the liquid adhesive. This coating will help to slow absorption of the glue and thus will help to prevent the picture from curling while you are applying it to the mounting board.

NOTE: Don't use the finest picture in your materials file for your first attempt at wet-mounting. A few trial wet mounts should be tried first.

Laminating

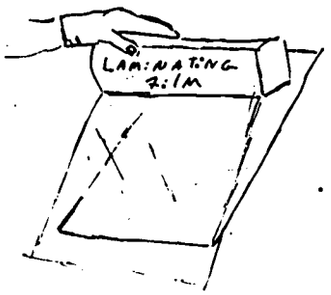
While dry mounting makes materials more durable and attractive for display purposes, the material is not protected from moisture and wear, much better than it was originally. To further protect the material as well as to add certain manipulative features, such materials should be LAMINATED.

Lamination seals the picture in a clear, nonglossy plastic covering that permanently protects it from dirt, moisture, and tearing. The plastic material is flexible, light in weight, and sufficiently strong to prevent damage from continuous handling. The use of a plastic mounting makes feasible the circulation of sets of pictures from school to school within a system.

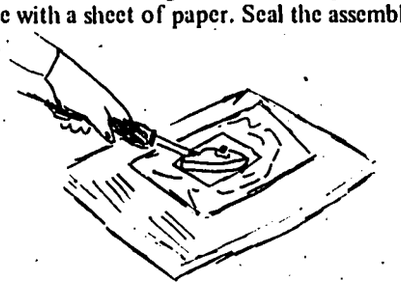
STEPS IN LAMINATING:

1. If the picture has not been dry mounted within the last 2 or 3 hours, pre-heat the material approximately 1 to 5 minutes.

Laminating



1. Cover the side to be laminated with laminating film - dull side next to picture – shiny side out.
2. Smooth film out on the picture with side of hand. Then tack to the picture.
3. Trim excess film so none overhangs the mount edge.
4. Cover the picture with a sheet of paper. Seal the assembly in the press for at least 15 seconds.



5. Immediately after removing the picture from the press, cool it under a metal weight for one or two minutes.

Additional details to consider when laminating:

If bubbles appear under the lamination film they are due to moisture in the picture or cardboard expanding to form steam. Place the mount back in the press for about 45 seconds and cool again.

It may be helpful, instead of cooling under a weight, to rub firmly over the affected area with a wadded handkerchief.

If bubbles persist, break them with a pen and press again or rub by hand again. Because of bubbles, the film may stretch, resulting in a wrinkle.

If unmounted pictures are laminated (to protect and display both sides of a sheet), seal one side with film, then repeat the process on the second side.

If materials to be laminated are wider than the roll of film to be used (11", 20", and 22" rolls are available), butt adjacent pieces together. Seal each in turn, in the press.

Thin three-dimensional objects, such as leaves, can be laminated easily to cardboard. Before starting, secure the object in place with rubber cement.

When laminating glossy photographs, follow the above procedures, with these changes:
Set the thermostat on the press at 325 degrees.

Wipe the surface of the photograph with cotton moistened in rubbing alcohol. Allow thorough drying before laminating. Preheating the photograph is unnecessary.

Apply additional pressure in the press with an extra piece of cardboard or masonite.

Protect face of picture with a sheet of thin paper.

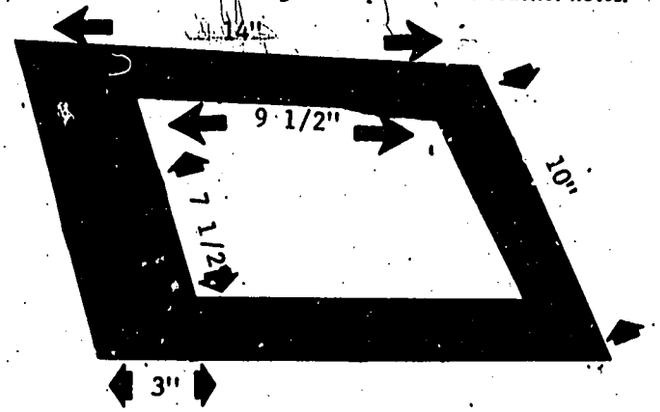
Maintain pressure in the press for at least one minute. Cool immediately under a weight.

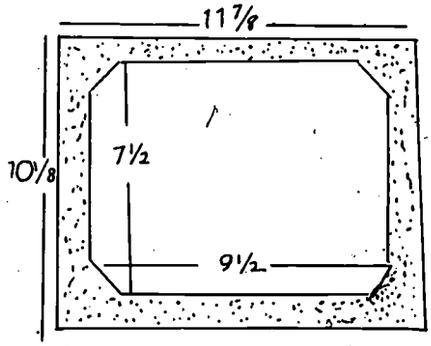
Framing

In order to add durability and ease of handling, a trasparency should be framed. A frame not only protects the transparency, but it also provides writing space for labeling and/or notes. Framing is very important for a permanent transparency, but if a teacher plans to use the transparency immediately or only once, then framing would probably be too expensive or time consuming to use.

Frames can be purchased from almost any audiovisual supplier, but a mounting frame can be made from a six ply poster board or any other suitable type of cardboard. The cardboard should first be cut into a rectangle that is 14 inches long and 10 inches wide. From this, cut an opening in the rectangle which will be 9 1/2 inches long and 7 1/2 inches wide.

NOTE: The three inch wide margin is to provide for teacher notes.



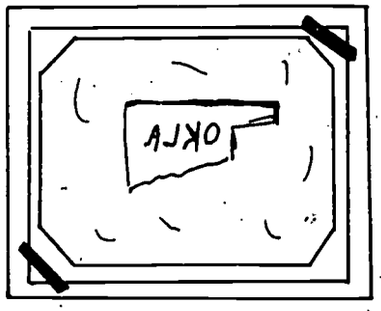


The standard size for a purchased mount is usually 10 1/8 inches by 11 7/8 inches, with an opening of 9 1/2 inches by 7 1/2 inches.

Steps in mounting a transparency in either a hand-made or purchased frame:

1. Work on a clean, bright surface. Dust, dirt, and other materials can easily scratch and permanently damage the transparency film. The brighter the surface, the better the visual will show up and you will be able to properly center the transparency on the frame.
2. Keep the baseline on the visual parallel to the edge of the mount.

NOTE: A titled visual looks out of place when projected.



3. Tack the film to the transparency mount at two opposite corners.
4. Check to see if the transparency is properly centered. If this is to be a permanent mount, tape the other corners and then tape the transparency sides to the frame.

NOTE: If this is to be a temporary mount, just tape the corners with masking tape. This tape is easily removed and the mount can be used again.

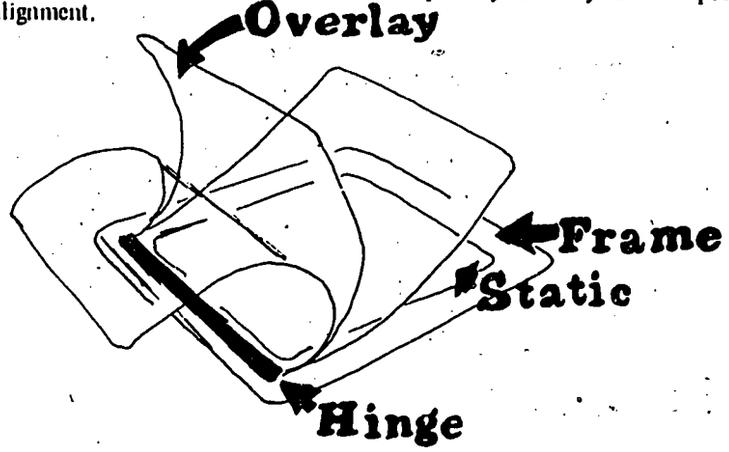
FRAMING OVERLAYS

In a transparency overlay, several elements are hinged to the sides of the

mounting and flipped on or off the basic transparency as needed. They are hinged to the mount, thus removing the possibility of damage to the transparency.

Steps in mounting an overlay transparency:

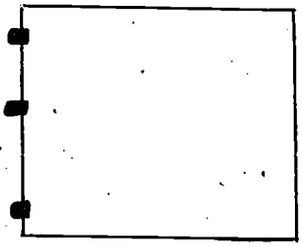
1. Frame the base static transparency to the underside of the mount as usual for a standard single transparency.
2. Align the overlay over the base transparency so they are in proper alignment.



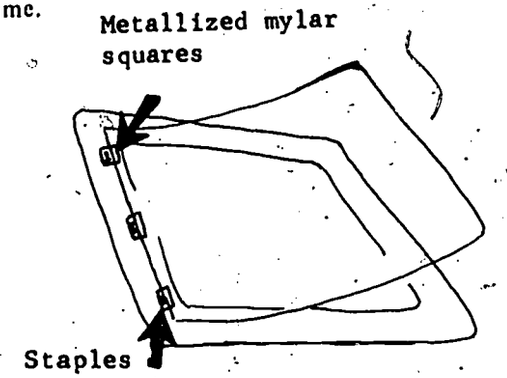
3. Place a strip of hinging tape on the edge of the overlay, sticking the overlay to the frame.
4. Continue this procedure until all overlays have been mounted.
5. Overlays can be mounted on either the left or right side, and if necessary, the top or bottom. (The top should be the last to be used.)

Another process for attaching overlays to the base transparency is by the use of a special stapler and metalized mylar squares.

1. Special metalized mylar squares are attached to the overlay sheet.



2. The sheet is then attached to the frame by the use of special staples. It is stapled directly to the frame.



3. As with the hinging tape, overlays can be attached to both the right and left sides and also the top and bottom when necessary.

SECTION VI

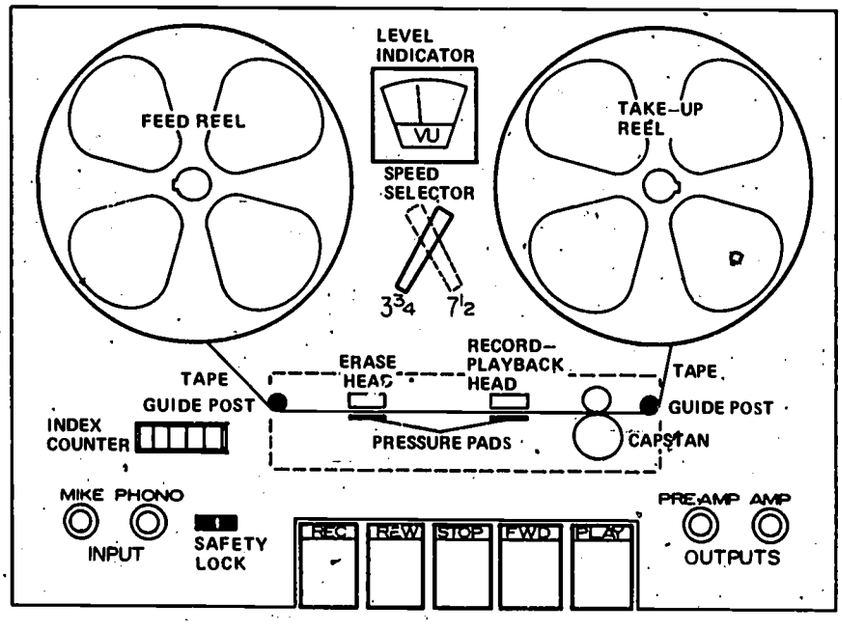
Tape Recorder

WHY USE AN AUDIO TAPE RECORDER?

1. The student can hear himself as he sounds to others. The student hears the sound of his voice through air which is very different from the way he normally hears himself through bone conduction, hence the "is that me?" attitude when a student hears himself for the first time. Unfortunately, this thrill bypasses the student all too often in many of our classrooms because the instructor finds that it seems too difficult to operate.
2. The recorder allows an individualistic approach to instruction. Since editing and splicing is so easy, the instructor can now create his own programs. He can record music and talk simultaneously with many of today's records which have outputs for recorders. The only limitation is the creativity of the instructor.
3. Most recorders designed for classroom use are so easy that students can operate them without teacher supervision. This lends itself to laboratory study in the sciences and, of course, language.
4. It can be replayed immediately after recording. This feature can lend itself to speech preparation or music recitals.

5. The recorder allows teachers to record special events on the scene. The instructor can record what is happening for a "special" report to his class the very next day. For other sources, the instructor can record special broadcasts or news programs that, when coupled with his students' comments, will create new excitement and will motivate students to write or draw on the subject presented. Unless specifically prohibited, the limit is only the law, and that is no limit as long as the instructor does not charge admission and state that the tape is his idea or production.

PARTS OF THE TAPE RECORDER:



A FEED REEL supplies the tape to be recorded. Most tape recorders in use in schools today have a dual record head which enables the user to record on both halves of the width of the tape. After the tape has been recorded, lift the take-up reel from the spindle, turn the reel over, and place it on the feed reel spindle for recording in the opposite direction. Tape reels are marked "Side 1" and "Side 2," the same as disc recordings, which simplifies the indexing and locating of recordings.

The RECORD LEVEL INDICATOR aids as a warning to prevent overrecording or underrecording. Overrecording will cause distortion in the finished tape while underrecording results in loss of volume and increased

"hum." Distortions and background noises cannot be erased from the tape without destroying the desired portion of the recording.

The TAKE-UP REEL serves as a terminal for the tape after it has been transported through the tape channel for recording or playback. If a dual track recorder is being used, the take-up reel should show whether Side 1 or Side 2 is ready for rewinding or playing. As an example, Side 1 will be up on a blank tape, so the take-up reel should have Side 1 up also. If track or Side 1 has been recorded, turn the full reel (formerly the take-up reel) over so that Side 2 is up. This positions the tape "heads up" for Side 2 and can be recorded in the opposite direction.

The SPEED SELECTOR is similar to the device found on a variable speed disc or phonograph playback for selecting speed. The slower the speed, the greater the amount of record or playback time. However, with the tape recorder, the slower speed gives a decline of quality while economizing with tape; the higher speeds make possible a higher quality of sound but doubles or triples the amount of tape used. This will indicate that for ordinary narration the slower speeds are desirable for the reason of tape economy; but for music or speech correction where critical listening is essential, the faster speeds should be used.

Tape, like a disc recording, must be played back at the same speed at which it is recorded. The popular home and school recording speeds are 3 3/4 ips (slow) and 7 1/2 ips (fast). Commercial and professional recorders have a much greater range of speeds. If you are recording for a radio broadcast, either narration or music, 7 1/2 ips is preferred by broadcasters to the slower speed.

GUIDE POSTS direct the tape in a straight path through the tape channel.

The ERASE HEAD sets up a strong magnetic field to neutralize any previous recording or noise which may be on the tape. The erase head is nonmagnetic while playing back but is activated by a safety or record key.

The PRESSURE PADS are small felt pieces on a spring and hold the tape firmly against the heads while playing back or recording.

While recording, the RECORD-PLAYBACK HEAD sets up a magnetic field which arranges the microscopic particles of iron oxide coating on the tape into a pattern. When playing back, this magnetic field is reversed and the recorded pattern sets up electrical impulses which go to the preamp and speaker, to be heard as the identical sound which was recorded.

No recording, whether voice, music, or any sound, can be of better quality than the machine which records or plays it back. Recordings made on shoddy equipment will always reproduce poorly. High quality recordings played on the same shoddy equipment will also reproduce poorly. It is economical and wise to determine the quality you need, then avoid the junk on the market. A poor investment in equipment can never be turned into a good one.

The CAPSTAN pulls the tape through the machine at a constant, even speed. A rubber coated roller presses the tape against the capstan while the machine is in record or playback position but releases the tape while in forward or rewind position. The capstan sometimes accumulates dust and other foreign

substances which may interfere with the quality of sound reproduced. This accumulation can be removed by running a cleaning tape through the machine or by saturating a cotton pad with rubbing alcohol and holding it against the capstan while the machine is running.

INPUTS serve to carry electrical impulses into the recording amplifier which biases and sends the current to the record head. The MIKE INPUT receives the plug or phone jack which is attached to the microphone patch cord. The PHONO INPUT receives the plug attached to one end of the patch cord which may in turn lead to a radio, another tape reacorder, television set, or a phonograph playback. One end of this patch cord may have an alligator clamp or other clamp for attaching to the wire leading to the speaker of another piece of audio equipment (radio, television, etc.)

OUTPUTS carry the electrical impulses away from the tape recorder, via a patch cord, for "dubbing" or to an extended speaker for the final sound reproduction.

The SAFETY LOCK is in reality a switch for the erase head; it prevents accidental erasure while playing back. It allows current to pass through the erase head, setting up a strong magnetic field which neutralizes the iron or ferric oxide particles on the tape. The tape then passes directly into the record head where new magnetic patterns are arranged in the tape coating. This can happen accidentally if the tape is stored near a large electric motor or comes into contact with a bar type magnet.

Bulk erasers may be used to obliterate or erase recorded tape; but for average home or school user, the best bet is to stick with the recorder's built-in erase head.

On some recorders the RECORD KEY and PLAY KEY are the same. In this case the safety lock also reverses the magnetic flow in the head while recording. Most recorders, however, have a separate record key which reverses the flow of current being fed to the head. The arrangement of the keys is a manufacturer's preference and has nothing to do with the final recording.

A REWIND KEY rapidly returns the tape to the feed reel for playing back. If the tape is to be stored, it should not be rewound because the high speed in this process does not allow for smooth placing on the reel. This could cause the tape to "set" badly or become uneven. Never store tape where it will be subject to high humidity or great variations in temperature.

Any piece of mechanical equipment must be stopped before it can be set into a reverse motion. The tape recorder is no exception; therefore, the STOP button, key, or lever position is normal in the process of operation.

The FORWARD KEY enables one to go forward rapidly to find a desired selection or to change tracks or sides. The tape always passes through the tape channel during the rewind or fast forward wind.

Finally, the PLAY KEY sets up a current in the playback head which carries the impulse pattern from the tape into the preamp and to the speaker for the

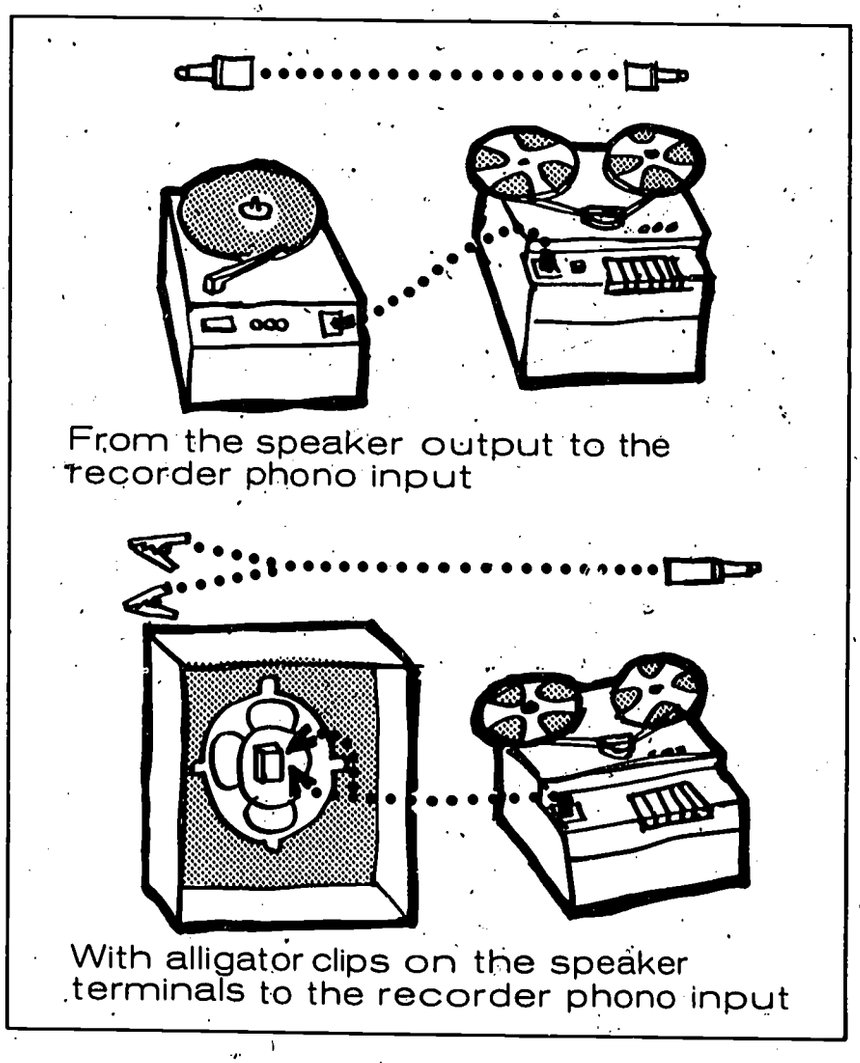
final reproduction of sound. A tape may be played literally thousands of times and never lose its fidelity so long as it is not damaged by excess heat, high frequency vibration, moisture, or brought into a strong magnetic field.

PROCEDURES FOR *Classroom Recording*

1. Place the recorder on a sturdy table free from sway or possible tipover.
2. Disassemble recorder and plug into accepted electrical outlet. Most portable recorders run on 110 circuit.
3. Turn on recorder to allow amplifier time to warm up. Make sure volume or "gain" is as low as possible.
4. Plug microphone into "mic" jack.
5. Thread recorder with "clean" tape. If tape is freshly taken from wrapped carton, unreel about one and one-half turns of tape and cut with scissors (Demagnitized scissors are preferred so as not to disarrange the iron-oxide pattern on tape.)
   Cutting the tape will eliminate any sticky substance left by the binding tape put on by the manufacturer. If this tape is left on, serious damage to the recorder could occur.
6. Press the "record" button, and if possible, hold "pause" control to stop forward motion of tape. This action gives you the chance to set your volume before you start recording.
7. The student can now speak into the microphone. You should allow him to hold the microphone only if necessary. If at all possible, use a microphone stand. Most people have a bad habit of rubbing the microphone while they talk, especially if they are nervous. The microphone, except under special conditions, should be around six to twelve inches from the mouth. If the student speaks with a slight whistle, the microphone may be moved to one side or the other of his mouth.
8. While the individual is reading his script in his normal speaking voice, do what is known as "ride gain" on him. That is, simply adjust the volume until the "volume unit" (VU) meter "peaks" as you want it. VU meters vary from those containing a needle which fluctuates on each portion of sound to a "magic eye" type unit. On the former, the needle should enter the red only slightly on the loudest sounds. If the needle remains on the "red," your recording will be distorted. If, on the other hand, the needle never moves, you are not recording at all. The "magic eye" type of monitor works the same except the distance between a green light varies with each sound. If the light is constantly overlapped, you are "over recording" which results in distortion; and if the light never varies you are "under recording" which results in little if any sound.
9. While riding gain, do not hurry, for this is a perfect time to listen to your student speak. When you have determined if he is still nervous or if he is

speaking his natural voice, you can proceed to the next step which is merely to release the pause control and let your student speak or to play with the recorder in order to give him time to settle himself.

PATCH CORDS:



The use of "patch cords" can open a whole new world to audio recording. Patch cords are wires with plugs on both ends. They come in endless variety of lengths and combinations of end plugs. The purpose of patch cords is to connect a source such as television, record player, or another recorder to your receiving recorder. The advantages of this type of recording over the use of a microphone to record other sources should be obvious. With patch cords, only the sounds desired are recorded rather than the many extraneous sounds, such as the baby crying or a passing train, which occur during the recording session. However, there is some danger involved to the user if he attempts to connect with machines which have no "output jacks." Therefore, *extreme care* should be taken if one wishes to jack into his television set for example. It is often worth the expense to have a repairman make the connection for you.

But after the connection is made, imagine the thrill your classes would receive by hearing recorded television or radio news programs. Until new laws are passed, it is permissible to use television and radio material as long as proper credit is given and no charge is made for its use and unless specifically prohibited by the network.

To use patch cords for recording, one simply has to plug into the output jack of the source and plug the other end of the cord into the input jack of the receiver recorder. From then on, recording is the same as recording an individual's voice.

EDITING:

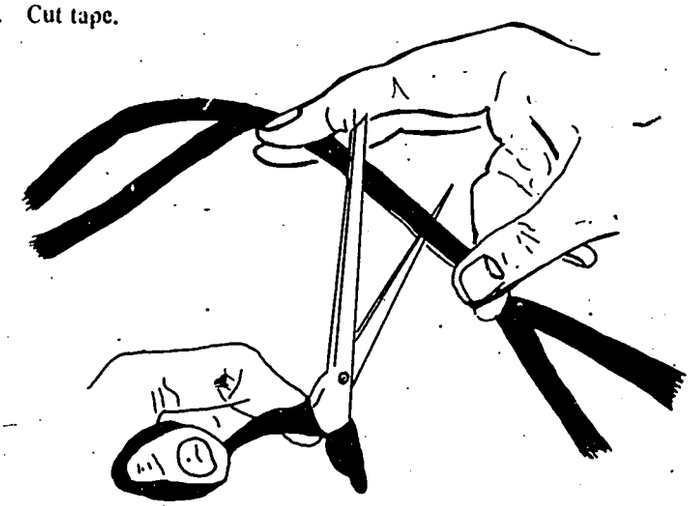
Talks by inexperienced speakers may be tape recorded and later "edited" to remove those embarrassing long pauses and the hemming and hawing that goes with inexperience in front of a microphone. A tremendous advantage of tape recording over disc recording is the ability to edit tape. An ordinary pair of scissors may be used to cut out a word, a phrase, or a pause from a recorded tape. A special type of gummed adhesive tape is then employed to put the two severed ends together again. The difference between splicing tape and film is that in the former no cement is used and the material used for splicing is applied to the base side and NOT the dull (iron oxide) side. Of course, one big difference is that on the former mentioned, it is perfectly all right to use tape (as long as it is the right kind) whereas on the latter, NO tape can be used.

The following are procedures used for editing and splicing tapes. These steps are briefly stated, therefore, if any point is not clear, further research will be necessary.

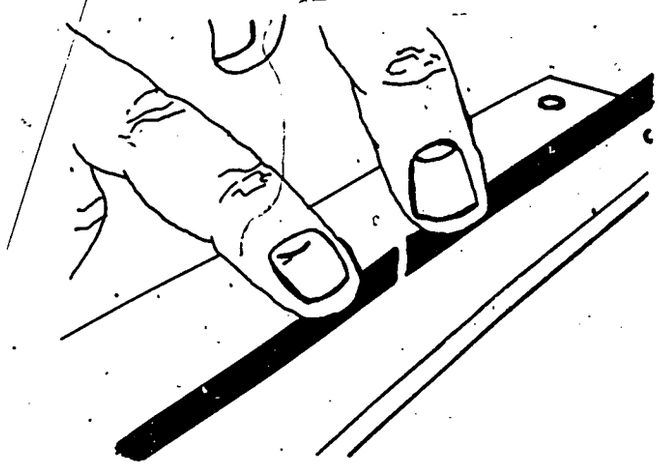
1. Rock reels back and forth until the beginning or the end of questionable sound is centered on the playback head.
2. Mark the tape in the center of the playback head with a grease marking

pencil. MARK ONLY ON GLOSSY SIDE. Mark as little as possible on the head.

3. Cut tape.

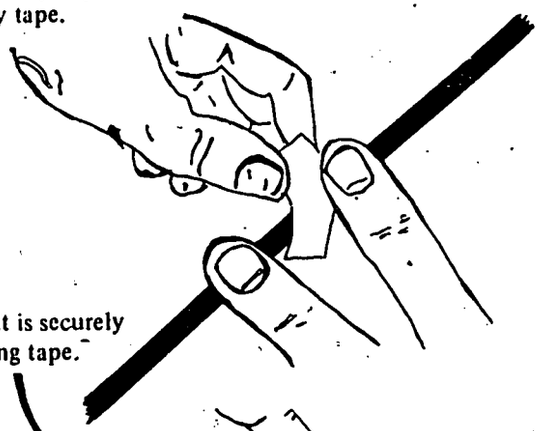


4. Align the ends of the tape for diagonal cutting with scissors or single-edge razor blades. Have both glossy sides up.

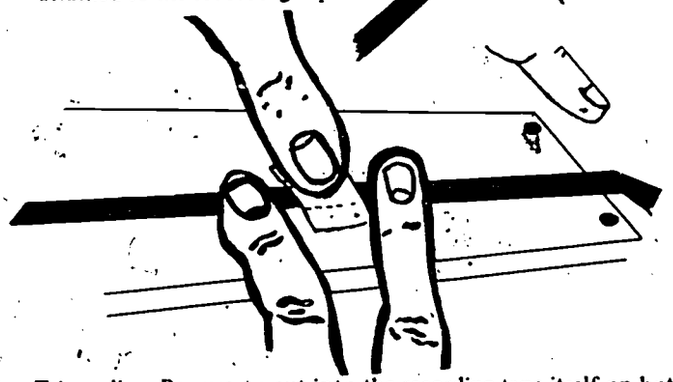


5. Align the ends of tape.

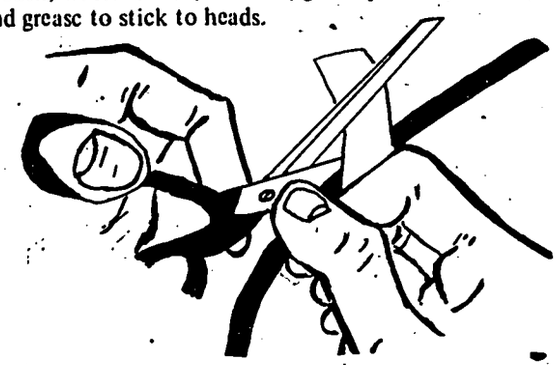
6. Apply the splicing tape on the glossy side. If applied to the dull side, iron oxide in the area covered by tape will not only be gummed but also will be permanently arranged by tape.



7. Rub splicing tape until it is securely attached to the recording tape.



8. Trim splice. Be sure to cut into the recording tape itself on both edges. Any splicing tape left bulging over sides will come in contact with the head for the next playback, which could, and will, gum up heads, thus causing dirt, grime, grit, and grease to stick to heads.



EARPHONES WITH THE TAPE RECORDER

When using any type of external speaker with the tape recorder, it is necessary to "pipe" the sound from the recorder through a patch cord and into the speaker for the final sound reproduction. Earphones are individual speakers which make it possible for a single person to listen to the recording without distracting others in the same room or even at the same instructional station. At times it is desirable for a small group to listen to a tape recording without involving the whole class.

A junction box or jackbox is used when several students want to listen to the same recording simultaneously. The jackbox is plugged into the external speaker jack of the recorder. Those wishing to listen, plug their headphone sets into the junction box, which may accommodate from six to twelve listeners.

VOLUME CONTROL WITH MULTI-LISTENERS

Since optimum listening takes place within a range of audio-reception levels, it is not too difficult to adjust the volume level to a small group. However, there are variations in listening comfort; the instructor should consider this when assigning a student to a listening group. The student with a hearing problem may need to listen alone or have a special headset which has its individual volume control mechanism.

For a group, the volume should be gradually turned up to a point of listening comfort. Too much volume can actually cause pain; too little volume will add to the necessary concentration, consequently fatiguing the student or losing his interest.

LEADER TAPE AS AN AID TO LOCATING SELECTIONS

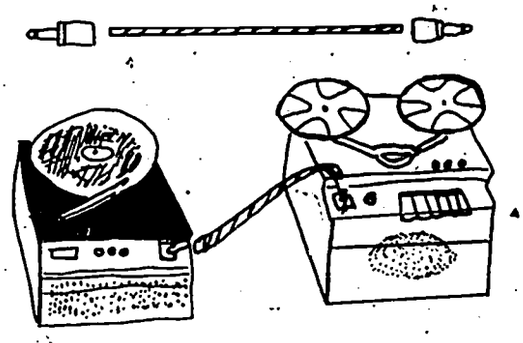
Several selections are often recorded on a single reel of tape. These may be songs, instrumental music, language lessons, sound effects for school plays, tests, etc. But whatever the selection, the simplest way to locate a particular one is to separate them with leader tape. Titles or other identifying data may be written on the leader immediately preceding the selection. Since the white leader is readily seen, guesswork about the position of the selection on the reel is eliminated. Title and position of selection should also be listed on the back of the storage carton.

Only one track of tape should be recorded when this system of selection identification is used. Otherwise, cutting and splicing would damage the recordings on the second track.

Copying From Recordings

COPYING FROM DISC RECORDINGS AND OTHER ELECTRONIC AUDIO SOURCES

Under the best circumstances, life of a disc recording varies from 30 to 40 playings. Friction from the needle wears down the microgrooves in the disc, which causes a loss of fidelity. Breakage occurs, and scratching and warping take their toll of disc recordings. With tape recordings, these hazards do not exist, or they are greatly reduced.



In order to copy from a disc record playback, use a patch cord plugged into the external outlet of the player; it should lead to the phono input of the tape recorder. The volume being fed into the recording unit can be determined by checking the volume unit meter or other recording level indicator. Some tape recorders have a "monitor" switch so that you can monitor the volume for bass and treble or distortion due to over- or under-recording.

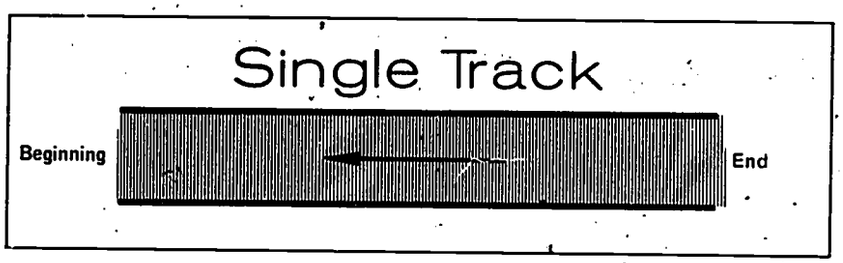
Additional copies of a tape recording may be made by using two tape recorders joined with a patch cord. Plug the jack into the external output of the source machine, then plug the other end of the patch cord into the recording unit. The volume of the recording is determined in the same manner as above.

There are several good electronic audio sources available in classrooms or buildings. Some of these sources are: Radio, Television, Public Address systems, and Sound Motion Picture projectors.

If these audio sources do not have external speaker (phono output) jacks, they can be installed; or alligator clamps may be used on one end of the patch cord. Attach the two clamps to the bare wires near the speaker cone, and plug the jack into the input of the recording unit.

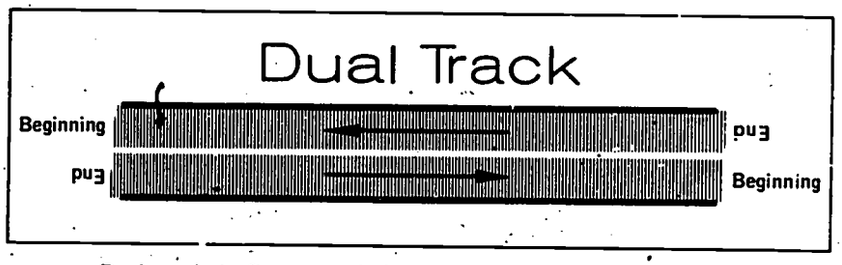
Tape Tracking Configurations

SINGLE TAPE CONFIGURATION:



Machines which record the full width of the tape are called single track machines. Most of the tape recorders in our school system are dual track machines which give the following track configuration.

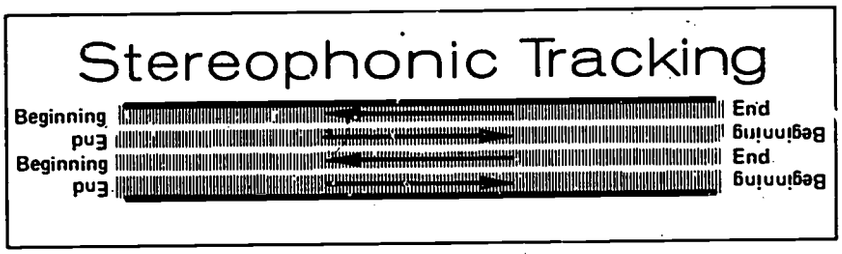
DUAL TRACK CONFIGURATION:



Dual track is first recorded in one direction all the way through the tape length. Then the tape is turned over and the recording is continued in

the opposite direction. This permits doubling the tape recording time on a single reel, which is an operating economy.

STEREOPHONIC TRACKING:



Stereophonic tape recorders record on four tracks. Tracks one and three are companion tracks, and tracks two and four are companion tracks. This tracking system is set up similar to the dual track recording system – the tape can be reversed so that side two can be recorded in the opposite direction. Stereophonic machines must use materials prepared especially for them if the best utilization of the machine is expected.

For use in language laboratories where the instructor records on one track and the student records on the companion track, it will be necessary to have a moveable sterophonic head. This being a special use of the stereophonic sound magnetic tape recorder, you should consult your serviceman for recording-head adjustment and instruction on usage.

SPEEDS

Magnetic tape recorders are designed to operate at various speeds depending on the model and make. The speed is determined by the number of inches of tape which pass the magnetic recording heads in one second. The five common speeds are 1 7/8, 3 3/4, 7 1/2, 15, and 30 inches a second (ips). The slower recording speeds of 1 7/8 and 3 3/4 ips are used for recording the spoken voice, particularly lengthy conferences or meetings. The higher speeds of 7 1/2 and 15 ips are commonly used for recording music and other types of high fidelity programs. Radio stations and sound recording studios usually record at the higher speeds of 15 and 30 ips to enable them to capture and reproduce sounds without distortion. Generally speaking, equipment which records at the faster speeds is more expensive than those which record at slower speeds because of the more complicated amplification system which is needed to obtain the very finest sound reproduction. Many who buy recorders at a "bargain" price often pay heavily when fidelity is desired. A good rule of thumb to remember when

dealing with recorders is: "One usually gets what he pays for." This is especially true of "cheap" transistor recorders because they do NOT have a standard operating speed. Many times tapes recorded on one of these "cheap" machines will not play back on another tape deck because the "cheap" machine usually operates at 4 to 6 ips or slower. Also, tapes recorded on these "cheap" recorders often will not play back on the same machine. Why? The speed at which the machine operates is determined by the power of the batteries. This means new batteries will cause the machine to operate at a faster speed than old batteries. Therefore, it is safe to say, save your money until you can afford a "good" machine with standard speeds (faster than 3 3/4 ips) and you will be rewarded at every recording session with extra dividends at every playback. Pride yourself and your recordings. Be critical. LISTEN! Do not be satisfied with passable sounds; strive for the best.

HOW TO FIGURE RECORDING TIME

Tape Length & Time (Recording Both Directions)

Recording Speed

	150 ft.	300 ft.	600 ft.	900 ft.	1200 ft.
3 3/4 ips	15 min.	30 min.	1 hr.	1 ½ hrs.	2 hrs.
7 1/2 ips	7½ min.	15 min.	30 min.	45 min.	1 hr.

TAPE ERASING:

Noises sometimes remain on the tape after erasure due to a phenomenon called residual magnetism. The noises caused by residual magnetism can be removed from the tape by using a special bulk tape eraser unit. Bulk tape erasers are also used to erase entire reels of recorded tape rapidly, without re-recording.

Bulk tape erasers contain a powerful electromagnet which disrupts the arrangement of iron oxide and thus removes the sound stored on the tape. The reel of tape need not be removed from the cardboard box. For best results, however, it is recommended that the tape be removed.

To bulk erase a reel of tape:

1. Place the reel of tape on top of the bulk eraser and turn on.
2. Rotate the reel of tape slowly through two or three revolutions and slowly draw it up and away from the eraser (usually two to three feet away). Turn the tape over and repeat on the next side by slowly lowering the tape back onto the eraser, rotating, and drawing away.
3. After tape is around three feet away, turn off machine. If the machine is

turned off with tape still on the eraser, the motor's hum will be recorded.

Be sure that your watch is anti-magnetic; otherwise, the watch will become magnetized and inaccurate.

Tape Handling PROCEDURES

1. Avoid storing unboxed reels of tape. The original box protects tape from dust and physical damage to its edges.
2. Store "on edge" or flat on individual shelves. Avoid stacking, because the wieght may distort the plastic reels or damage the edges of the tape.
3. Avoid extremes of temperature. If tape is subjected to extreme temperatures, such as in shipment, allow 16 to 24 hours for it to return to room temperature before using.
4. Occasional use of the tape improves storage characteristics. Playing the tape releases strains and adhesions.
5. Avoid excessive tension in rewinding tape for storage. The tape may become stretched or permanently distorted if wound too tightly. (Therefore, it is often better to avoid rewinding tape after last usage. Unless, of course, you are going to use it again in the next class.)
6. Cleaning of tape is not necessary in normal operation. If dust is excessive, the tape may be cleaned by wiping with a clean, dry, lint- free cloth while rewinding. Be Careful!
7. If tape has been stored six months or longer, you should rewind it once before using. When. storing acetate tape five years or longer under average conditions, store in sealed containers or with bread. With polyester tape, humidity control is not as important as with acetate tape.
8. In storing tape, do not allow the tape to come in close proximity to other speakers or metal, etc.
9. Finally, if you are careful, your tape will last for many years, and the beauty of it is that you can play tapes for unnumbered times with little noticeable effects. You know what happens to disc recordings. Remember your favorite 45 that you bought two years ago?

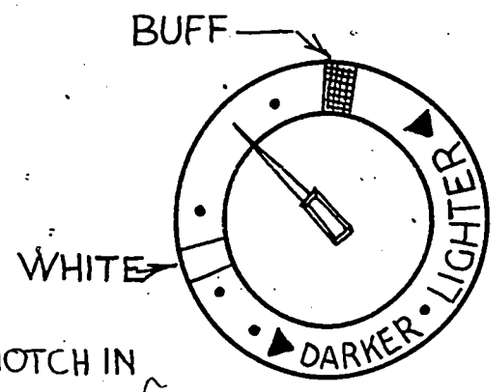
SECTION VII

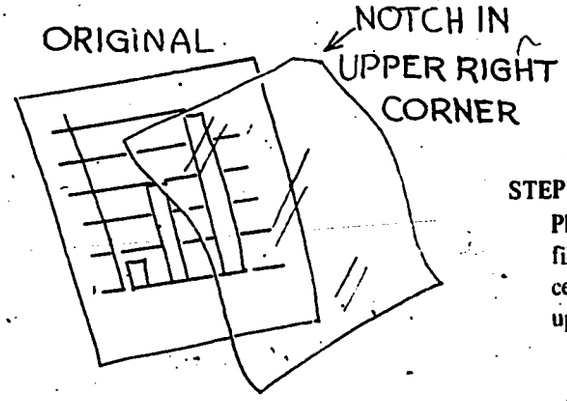
Preparation of Infrared Transparencies

STEP 1.

Set the exposure setting on the exposure dial of the thermo copying machine.

Proper exposure setting should be approximately mid-way between the buff and white markers on the dial. (Proper exposure should be determined by a test strip.)





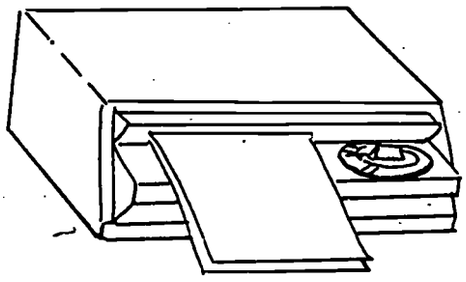
STEP 2.

Place a sheet of transparency film over your original. Make certain notch on film is in upper right-hand corner.

STEP 3.

Pass original with film on top through copy machine.

If transparency is too dark, set dial pointer closer to the buff marker. If transparency is too light and some detail is lost, set to a darker setting or toward the white marker.



NOTE:
The infrared process requires that the original be drawn with carbon-based lead or ink. For best results use a Number 2 pencil or black drawing ink.

There are a number of transparency films available: Black image on clear background, black image on colored background, color image on clear background, and color image on black and negative image. Color may be added with pens and markers and with colored adhesive sheets and tapes.

Photocopy Method

Transparencies from all color originals and bound documents will reproduce halftone illustrations.

STEP 1.
Place (pink) intermediate sheet, with notched corner in upper right, over original.

If original is unbound, place it on sponge like pressure pad.

STEP 2.
Place pressure glass, frosted side down, on intermediate sheet to assure positive contact between original and intermediate sheet.

STEP 3.
Place exposure on pressure glass, press down to assure uniform pressure. Set timer according to instructions (about 20 seconds). Press exposure button to begin exposure.

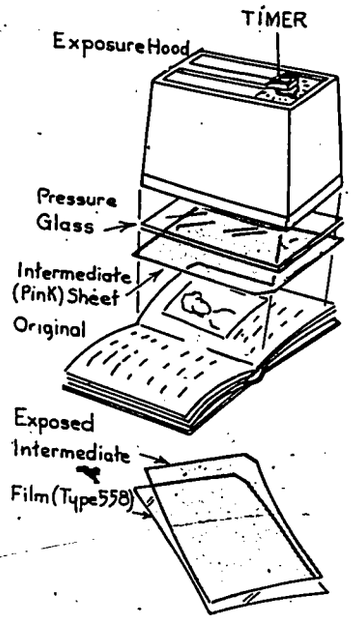
STEP 4.
Remove the exposed intermediate(pink) sheet and place it over a sheet of positive film 3M Type 558 matching notches.

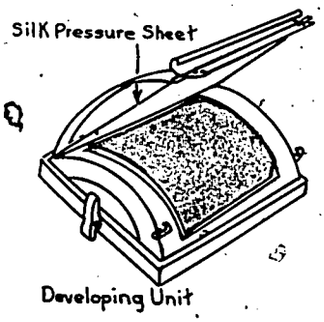
(Place a sheet of white paper under the film so you can watch the image develop.)

STEP 5.
Place the sheets with the negative (pink intermediate) on top and the paper under the bottom on the half cylinder of the developing unit. Close and latch the silk pressure sheet.

When the image is well developed, lift the screen and remove the film. Strip away the pink sheet.

If transparency is too dark, set timer for a few seconds more and try again.

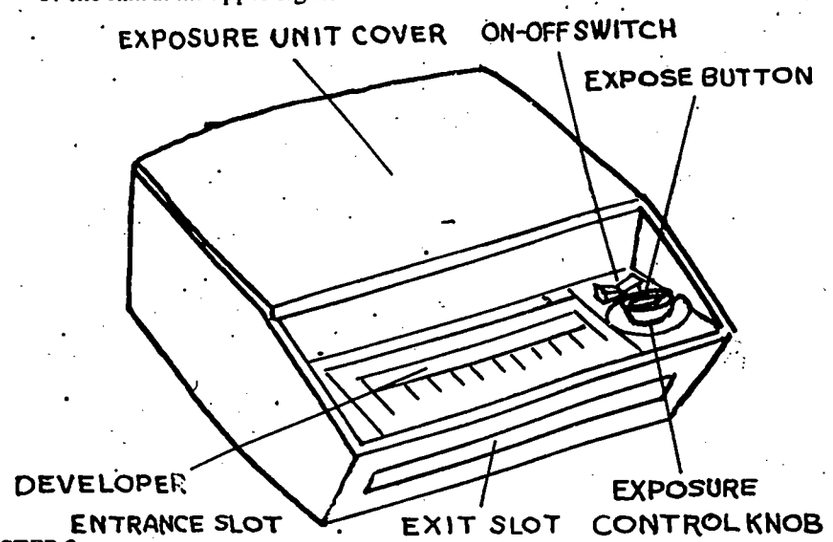

TIMER
Exposure Hood
Pressure Glass
Intermediate (Pink) Sheet
Original
Exposed Intermediate
Film (Type 558)


Silk Pressure Sheet
Developing Unit

Using The Model 76

STEP 1.
Turn on Photo Copier and let machine warm up for a minute or two.

STEP 2.
Place the pink intermediate sheet over the original, with the notched corner of the film in the upper right.

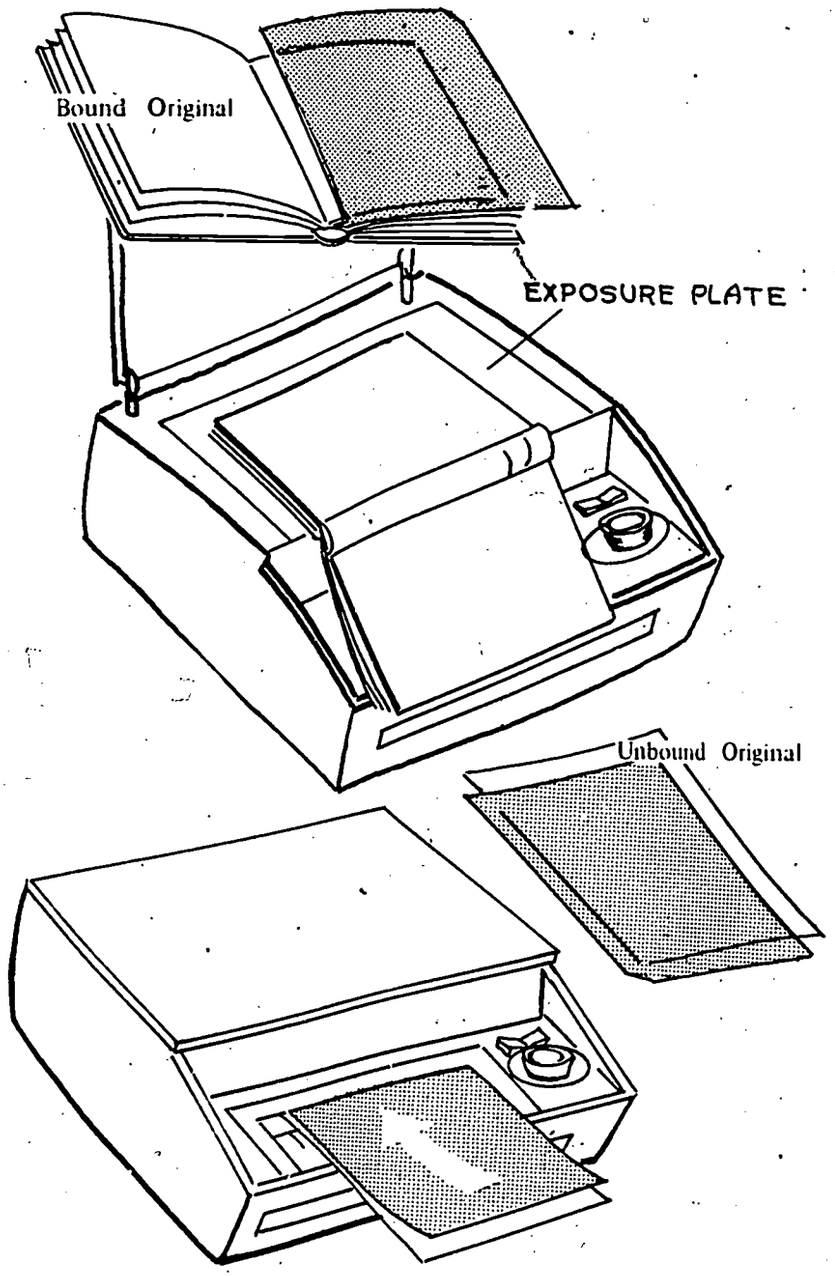


STEP 3.
Raise the cover and place the intermediate and original face down on the exposure plate. Close the exposure unit cover.

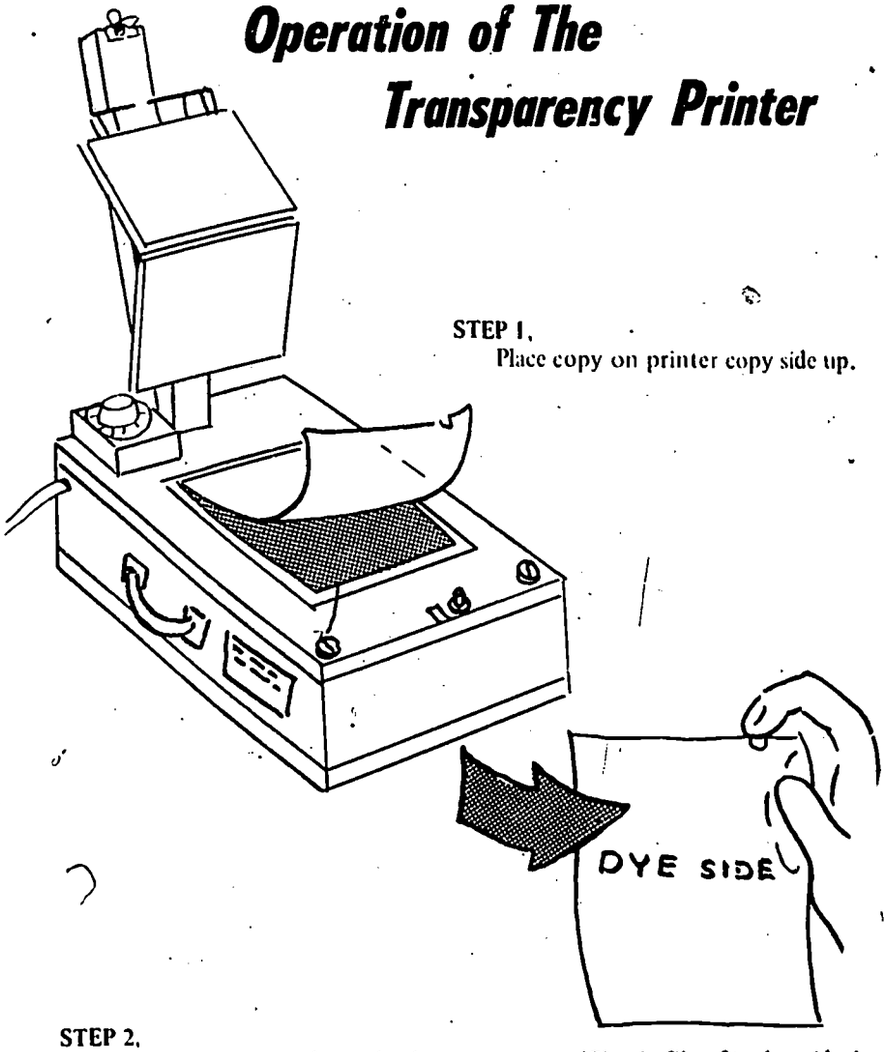
STEP 4.
Set the exposure control knob at the number 6 and press the exposure button. Note: to lighten your transparencies, turn the knob clockwise to a higher setting. To darken them, turn it counterclockwise to a lower setting.

STEP 5.
Remove the intermediate and original, strip away the intermediate and place it over a sheet of Type 558 film matching the notched corners in the upper right.

STEP 6.
Insert the two sheets in the developing slot. When the films come out, separate and discard the pink intermediate.


Bound Original
EXPOSURE PLATE
Unbound Original

Operation of The Transparency Printer



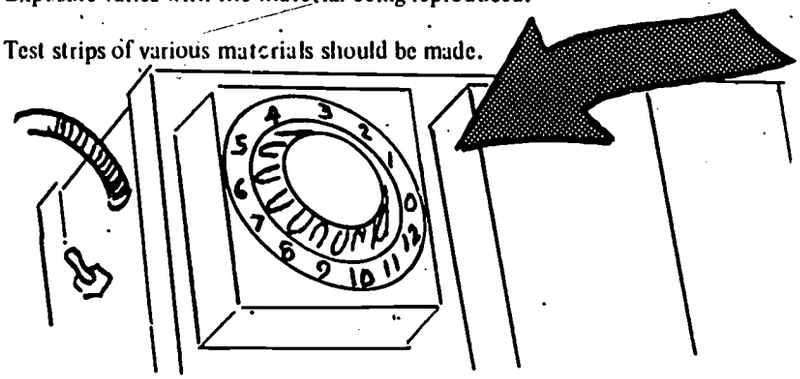
STEP 1.
Place copy on printer copy side up.

STEP 2.
Place Diazo Film dye side down on copy. (Check film for dye side by grasping in right hand with index finger in notch – dry side will be toward you.)

STEP 3.
Close printer and set Timer Dial for correct exposure, approximately 2½ to 3 minutes.

NOTE:
Exposure varies with the material being reproduced.

Test strips of various materials should be made.

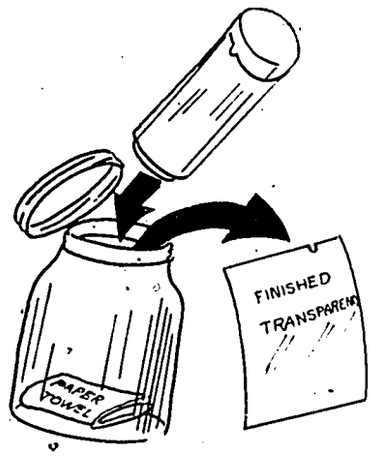


If transparency has background color, *Increase Exposure.*

If light or loss of detail, *Cut Down on Exposure.*

STEP 4.

Develop exposed film with amonia (27%) in pickle jar. (No dark room is necessary.) Development time is 2½ to 3 minutes. (You cannot over-develop.)



Transparencies By Lifting Process

Illustrations from magazines printed on clay coated paper can be made into transparencies by the lift method.

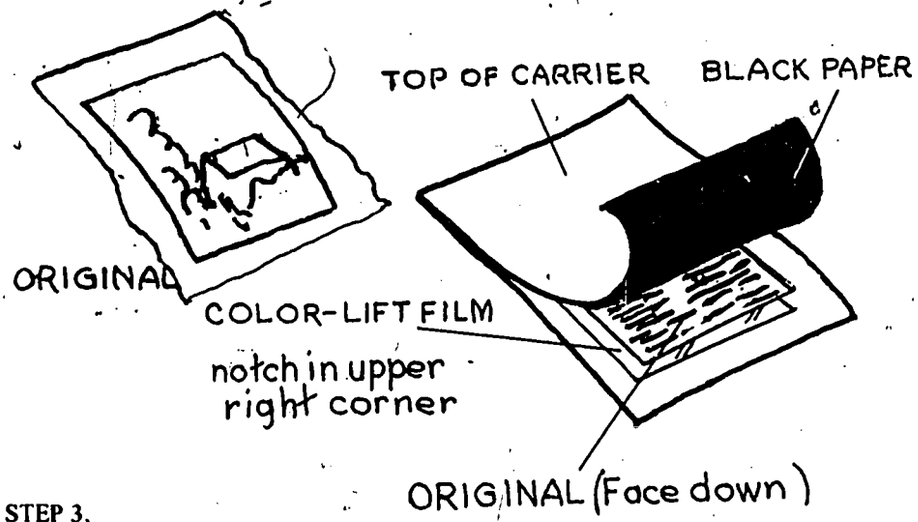
STEP 1.

Test for clay, moisten a finger and rub over an unprinted portion of magazine page. If there is a white chalky residue on your finger the magazine is suitable for making a lift.

STEP 2.

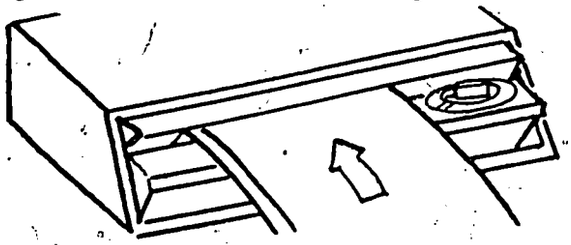
Trim picture and color film to the same size. Place picture face down onto the emulsion side of colorlift film.

Place in the carrier with black side of carrier on top of the original.



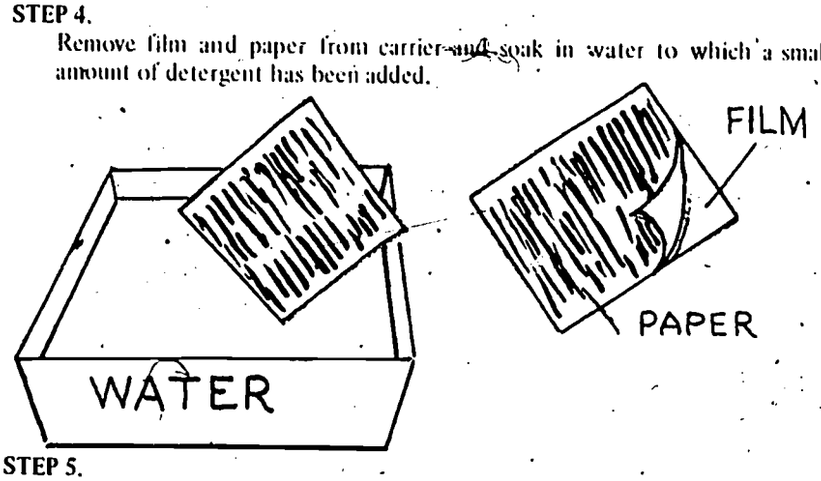
STEP 3.

Insert in Thermo copying machine. Set dial at the darkest setting.



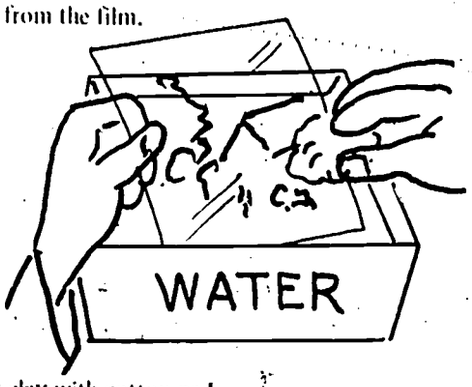
STEP 4.

Remove film and paper from carrier and soak in water to which a small amount of detergent has been added.



STEP 5.

After soaking, peel paper away from the film.



STEP 6.

Return to water and wash away clay with cotton pad.

STEP 7.

Dry. When dry, spray dull side with clear plastic spray.

Photographic Transparencies

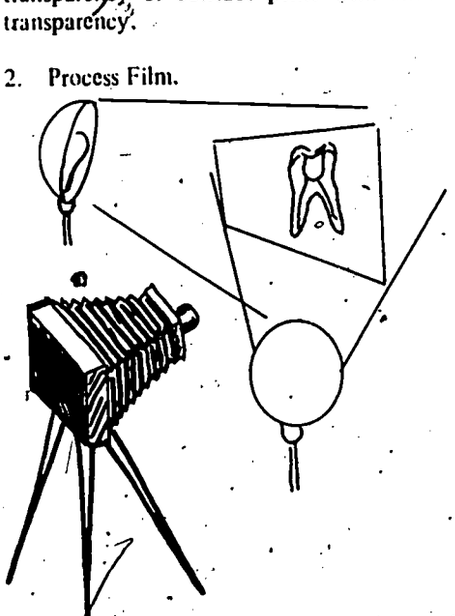
1. Place original on copyboard or copy stand and copy. Lamps should be at 45 degrees to camera axis.

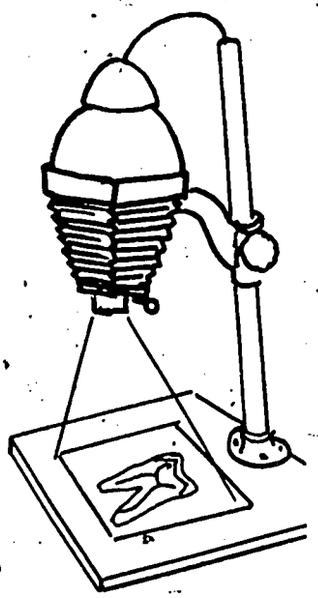
Photographic Transparencies

FILMS	COLOR SEN.	COPY	SPEED
Sheet Films:			
Contrast Process Pan	Pan	Line	80
Contrast Process Ortho	Ortho	Line	50
Kodalith Ortho	Ortho	Line	6
Gravure Copy	Ortho	Cont.Tone	12
Commercial	Blue	Cont.Tone	16
35mm:			
Panatomic – X	Pan	Cont.Tone	40
High Contrast Copy	Pan	Line	64

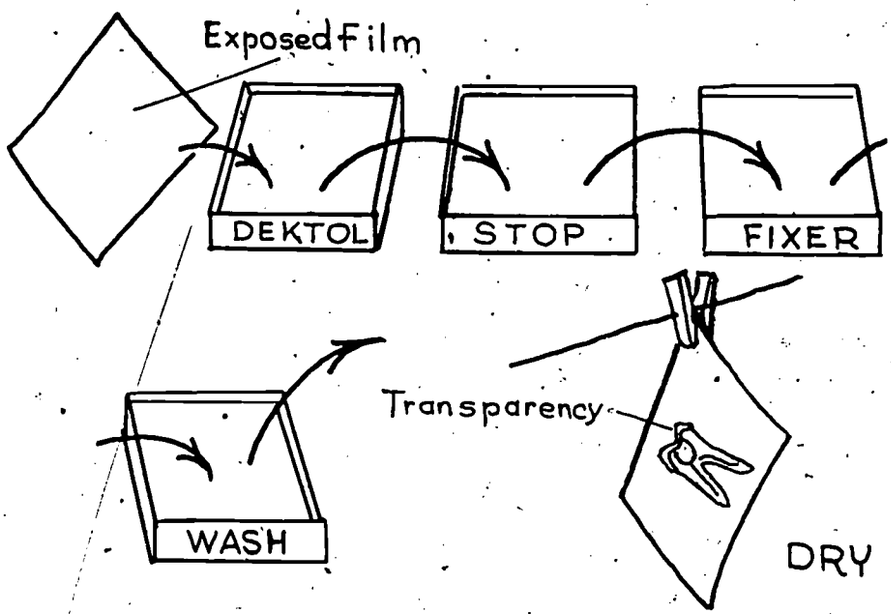
NOTE:
If you are using an 8" x 10" camera, shoot with Kodalith and use negative as transparency or contact print with another sheet of Kodalith for a positive transparency.

2. Process Film.





3. Place negative in enlarger (emulsion side down) and print on 8" x 10" sheet of Kodalith film. (Determine exposure by test strip.) (Kodalith film may be processed under red softlight.)



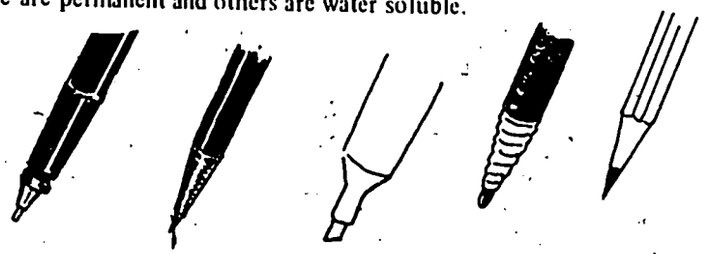
4. Process film with Dektol developer (1.2)

5. Mount for use, or use as a master for djazo transparency.

Handmade Transparencies

Transparencies may be made by hand on transparent sheets of acetate film (reclaimed x-ray film is excellent for this purpose.)

There are a number of pens, markers, and pencils suitable for this purpose. Some are permanent and others are water soluble.



The technical fountain pen or rapidagraph work well with drawing ink. There are also a number of felt tipped pens such as Flair which do very well.

There are several water soluble felt tipped pens which are designed for projection and project in brilliant color as well as being water soluble.

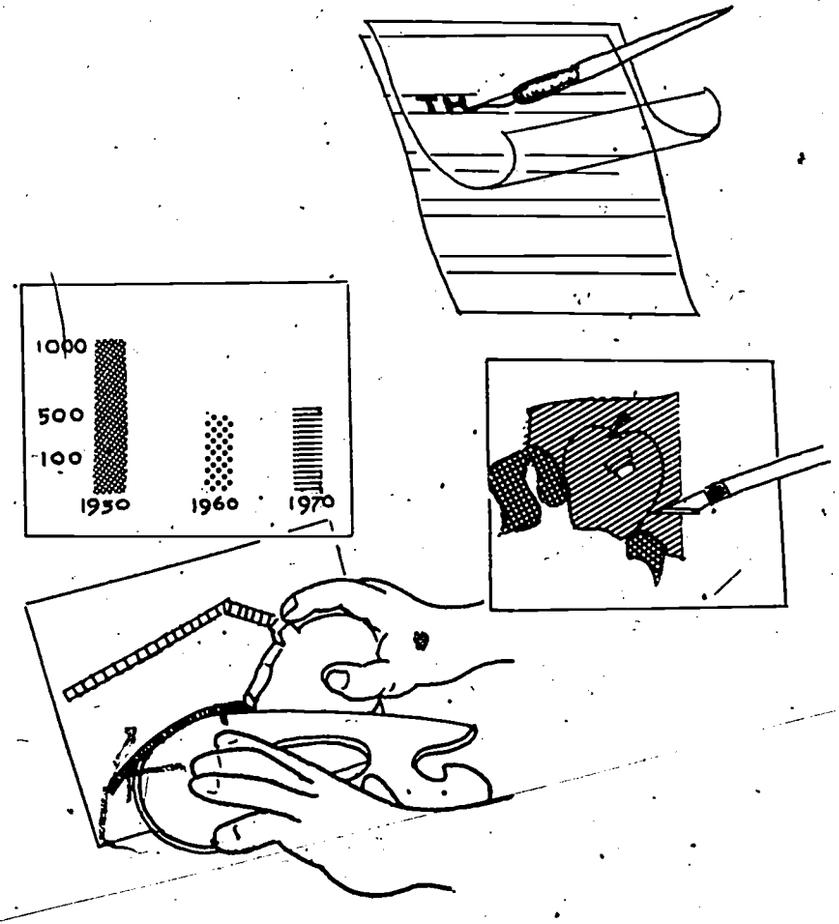
Examples of these are: 3M, Vis-a-Vis, Pentel, Dixon and others.

There are also felt projection markers. Those are good for larger color area and for accents.

There are grease pencils and audiovisual pencils designed to write on acetate. Some of these project in color, but it would be wise to check them first.

To keep your copy straight place a sheet of paper with guide lines under your acetate sheet. The material might be drawn on the guide sheet first, then traced on to the acetate.

There are many transparent adhesive-backed texture and pattern sheets, colored and pattern tapes, and colored adhesive sheets. They may be applied to the surface of any transparency to add color and texture. The unwanted film is trimmed and stripped away.



SECTION VIII

DISPLAYS

Bulletin Boards

The bulletin board can be an important part of the learning situation; and along with textbooks and blackboards, it is one of the oldest devices for enriching instruction.

To be effective, the bulletin board must be read and understood, therefore, the location of the board is very important. It should be located in a very well traveled place with plenty of space for viewing.

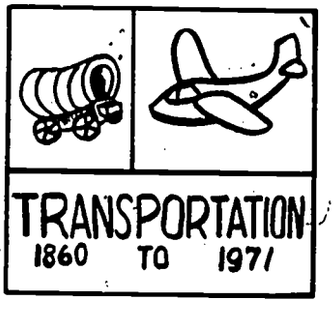
A bulletin board display not only presents information, but it also is used to display student's work, current events, and materials for building a unit or topic of study.

The purpose of the bulletin board is to communicate, and one way of doing this is to attract attention. This can be done by the use of color, materials, content, texture or unusual materials.

Textured materials also direct interest towards bulletin boards. This material includes burlap, corrugated cardboard, metallic papers, or wallpaper. In some cases, textures are used in the subject of the display; in others, they serve as background.

A bulletin board can be made fixed, movable, folding, suspended, or recessed and is usually made from a soft material. Most of the commercially produced bulletin boards are cork or composition board. One inexpensive board that may be prepared by the teacher is composition board, such as Celotex, covered with burlap. Another board the teacher can make is a board made by the use of cork floor covering. The cork squares, when damaged, are easily replaced.

Being confined chiefly to two dimensions on a bulletin board does not mean that one must be satisfied with flat effects. To add a third dimension, such as perspective, out-of-the-ordinary proportions, overlapping and shadow effects may be used.



Bulletin board displays are another means of using lighweight dimensional materials. Objects or figures made from polystyrene foam or balsa wood, paper sculpture or other lighweight materials may be useful in improving dramatic impact and arousing interest in a special area on the bulletin board display.

In planning the layout, there are several principles of design which are essential to an attractive, attention-getting display. These are as follows:

1. Simplicity: The basic design for bulletin boards should be simple. Basically, designs are merely arrangements of various lines which lead the eye where you want it to go and at the same time produce a pleasing overall effect.
2. Color: Color should be used for attracting attention, emphasizing, or providing a background. Good color is a fundamental in a good bulletin board. The color of the bulletin board itself should not contrast with the general color scheme of the room or the materials to be used on the bulletin board. A light, neutral color is preferred for all bulletin boards.
3. Headings and Captions: Every bulletin board needs a main or central heading. Headings and captions should be clear, simple, and to the point. Since headings and captions are usually the first to attract attention to the bulletin board, be dramatic, pose a question, solve a problem or make a statement in your heading.
4. Lettering: Lettering can be made in several ways such as hand lettering, cutout plywood letters, gummed stick-on letters, etc. But no matter what kind of lettering you use, be sure it is large enough and spaced correctly, so that it will be easy to read even from a distance.
5. Lighting: Make sure your bulletin board is placed in a well lighted area where students will be able to see and read it with ease. Artificial light is usually better for bulletin boards, as strong natural light has a tendency to make the bulletin board look washed out.

DISPLAYS

Felt Boards

The felt board or flannel board is simply some type of board covered with a long-fibered cloth and used to arrange study displays. The long-fibered property is the source of the board's holding power. When displaying materials backed with a long-fibered or very coarse-textured substance, the friction between the two sets of fibers is great enough to cause the materials to cling to the board.

The felt board is so simple to construct that many teachers may want to make their own. But first, the practicality of buying a commercially produced felt or flannel board should be considered. The purchased board may have many advantages in durability, appearance, and holding power that the teacher-made board would not have.

When constructing a board, ordinary flannel or felt is not suitable for the covering. A special fabric designed especially for felt boards is desirable. However, dress felt, or heavy flannel materials available in most fabric shops is sometimes adequate.

The following are instructions for making your own felt or flannel board:

1. You will need a heavy grade of flannel or felt fabric; a backing board of 1/8 inch masonite, 1/4 inch plywood or heavy cardboard; enough dry-mount tissue to cover the surface of one side of the board and either 2 inch carpet tape or enough molding to form a frame around the board.
2. For making the felt board you will need also a dry-mount press, a tacking iron, scissors, clothes brush, and possibly a saw, screwdriver and some small screws. (If a dry-mount press is not available a household iron using the wool setting can be used to perform Steps 3, 4, 5, and 6.)
3. Pre-heat the backing board and fabric to remove any excess moisture. (A dry-mount press or regular hand iron can be used.)

4. Tack the dry-mount tissue to the smooth surface of the board. Make certain that the entire surface is covered with dry-mount tissue.
5. Tack the fabric to the dry-mount tissue, being sure to hold the fabric taut and to smooth out all wrinkles.
6. Place the board and fabric in the dry-mount press. Make sure the fabric is completely free of wrinkles. Allow the fabric and board to stay in the press for 30 seconds before moving. Continue to turn the board and place it in the press until all the fabric is mounted to the board. Check for firm attachment.
7. Frame the board with two inch carpet tape or with molding.
8. When you have finished mounting the felt board, brush the fabric with a clothes brush to revive the nap flattened in the mounting press.

NOTE:
Flannel should be of a high nap type and should be stretched taut when being applied.

Another way to make a felt board is to cut the fabric to fit the board allowing about four inches to fold back over the board. Fold the cloth neatly at the corners and fasten tightly with staples, tacks, or tape. You may also catch the edges of the fabric with an embroidery needle and twine, stretching the fabric over the board.

Teachers may also wish to prepare their own materials for use on the flannel or felt board. Several substances will adhere to felt and cut-outs of these substances may be used. Lighweight objects such as children's drawings, title cards, mounted pictures and paper cutouts can also be used, if backed with an adhering material. The backing strips can be made of felt or flannel, steel wool, yarn, corduroy, sand paper or emery paper. Strips can also be made from commercially produced backing materials.

Following a few simple rules will help the teacher get the maximum utility from her felt or flannel boards.

1. Always protect the nap of the fabric. Store the board in a vertical position and occasionally give the fabric a light brushing to renew the board's holding power.
2. Store materials for the felt board in large envelop to prevent crumpling or rolling.
3. Place the board in a slightly inclined position for use. This will help increase the board's holding power.
4. Check materials with questionable adhering properties before class.

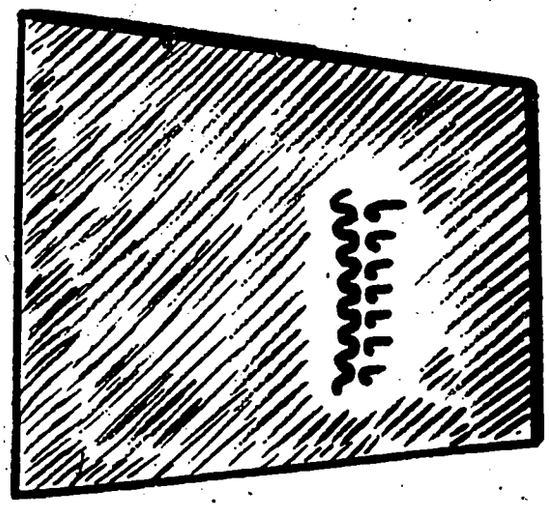
DISPLAYS

Hook And Loop Boards

A fairly new instructional device is the hook-and-loop board. The primary use of the hook-and-loop board is to display three-dimensional materials. This is accomplished by the surface of the board being covered with very strong nylon loops. Then small patches of material with nylon hooks are attached to the back of an object. The hook-and-loops, when pressed together, interlock to form a strong bond. Thus the object is held to the board. The interlocking is like a burr interlocking to the hair of an animal.

The supporting strength of the board is very remarkable, yet the object may be easily removed from the board by lifting it up and away at the same time.

Although it is possible to make your own hook-and-loop board, it is usually more practical in the long run to buy one. The purchased boards outlast the home-made boards.



There are four ways of attaching the hook tape to the back of an object.

1. Self-adhesive – just peel off the protective cover and press the tape in place.
2. Water activated – this type must be soaked in water a minute or so before applying it to the object.
3. Solvent-activated – this type must be soaked in a special solvent to make it stick to the back of the object to be displayed.
4. Adhesive - Just by adding a small amount of adhesive (rubber cement, household cement or other cement) to where you want the piece placed.

NOTE:
Mount hook tape near the top of flat objects and in the center of mounted objects. Also protect the hook piece when not in use to prevent it from being crushed or bent.

DISPLAYS

Magnetic Boards

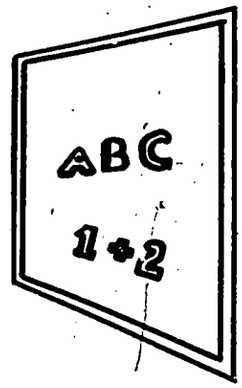
The magnetic chalkboard has all the advantages of the regular chalkboard plus it permits two and three dimensional materials to be displayed on the board.

The magnetic chalkboard is not really magnetic, but is made of a light weight steel, and by attaching magnets to objects or materials, the materials can be placed on the board for display.

A high quality magnetic should be used to display objects. Alnico, Ceramic, and Plastic magnets are among the best..

Magnets are expensive but they can be attached temporarily with masking tape to objects which will not be used permanently.

Magnetic boards can be purchased but they are also very easy to make.



1. Materials you will need: A sheet of light, flexible steel, (you could use a cookie sheet or possibly a piece of discarded storage cabinet) spray paint for chalkboard use, vinegar, chalk, and several rags.
2. Wash the steel sheet in soapy water and then dry.
3. Wash and then soak the steel in vinegar for approximately 20 minutes.
4. Rinse the sheet in clear water and dry.
5. Spray paint the steel sheet with chalkboard paint. Let it dry and then repaint it. After waiting 24 hours, chalk the board to give it a smooth writing surface.

DISPLAYS

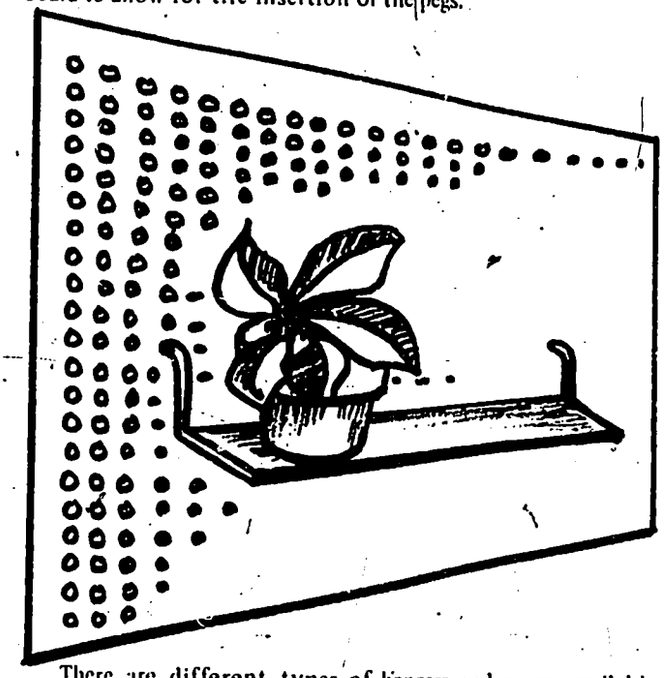
Pegboards

A pegboard is usually a perforated masonite sheet with regularly spaced holes in which pegs can be inserted. The board can then be used to support books, realia or other three-dimensional instructional materials.

Pegboards usually range in thickness from 1/8 inch to 1/4 inch. The 1/4 inch thick pegboards are usually the best for classroom use, as they have a greater durability than the 1/8 inch board. But the 1/8 inch board will work for smaller, lighter objects.

The larger pegboards can be wall mounted, while the smaller sizes can be made to stand alone on their own with the addition of shelf brackets.

For wall mounted pegboards remember to leave a 3/8 inch space behind the board to allow for the insertion of the pegs.



There are different types of hangers and pegs available for use with the pegboards. It is wise to buy the type of peg that will correspond with the holes in your board.

The pegboard may also serve as a base for the construction of some permanent instruction tool, such as a circuit board or a question and answer board.

Realia

What is realia? It is when actual objects are used is instructional tools. Such as when a teacher brings rocks, animals, plants or other materials into the classroom for the children to study and inspect.

A model for one society could be realia to another. For example, an American doll would be realia in the European classroom, but would be a model of life to the American child. Realia can be very important because instruction can be vitalized by using objects – both real and model.

Realia should be suitable to the classroom and to the present course of study. Merely introducing interesting objects which are unrelated to the curriculum might be acceptable for the younger grades in a "Show and Tell" session, but not appropriate for the upper grades. Therefore, realia should be used in the classroom and should have a direct relationship to topics being studied.

Realia is most often three-dimensional and requires special methods of display and storage. In addition, realia may be delicate, valuable or even irreplaceable. So realia poses problems which generally do not exist with other instruction media, both in storage and use.

The problems of delicate realia, such as ferns, grass seeds, etc., can be solved by embedding the realia in clear plastic. The clear plastic will protect the delicate objects and at the same time give the students a chance to see the realia which would have been too delicate to handle otherwise.

Live animals are another form of realia. Letting the class work with live realia will provide experiences not available by any other means.

WHERE DO TEACHERS GET REALIA?

1. Most teachers tend to be travelers and often collectors, too. Then armed with their artifacts of world wide civilizations, they can treat their pupils to first hand experiences and objects.

2. Exchange: If you are looking for a particular item from some part of the world, there is always the possibility that a teacher there would like to receive an instructionally useful item from your area. One way of finding teachers to exchange with is through WHO'S WHO IN AMERICAN EDUCATION. This standard reference work lists biographies of thousands of administrators and teachers, giving their addresses.
3. Sponsors: Many commercial firms are more than willing to send samples of raw and manufactured materials. You may be able to find such things as cotton bolls, petroleum products, wood samples and many other items just by writing.

   Two excellent source books for free materials are SELECTED FREE MATERIALS FOR CLASSROOM TEACHERS by Ruth H. Aubrey (Fearon Publishers, Palo Alto, California, $1.75) and ELEMENTARY TEACHERS GUIDE TO FREE CURRICULUM MATERIALS (Educators Progress Service, Randolph, Wisconsin $7.50.)
4. Government: State and local governmental agencies often will provide information on where you can secure objects needed for instructional use, but very few will provide the realia itself.
5. Field Trips: Probably the best source for securing local realia is on field trips. One group could hunt for stones, another for shells, and still another for leaves, etc. The realia secured locally often can springboard to more intensive study of your own area. Realia is the key to real learning.

Dioramas

A diorama is a three-dimensional pictorial representation of a scene, usually in miniature, using symbolic and sometimes real materials to create an illusion of reality. Its chief use in the classroom is to provide vicarious experiences inaccessible to the students because of location, time, and other factors.

Scenes of foreign lands, historical scenes, and scenes from literature and nature are a few of the topics that may be visualized effectively in a diorama.

Dioramas may be utilized at any grade level. Teachers and students should be familiar with the diorama and methods of constructing it. While it may be prepared at little or no cost, it requires a great deal of careful planning.

Unlike the museum's life-size habitat group, which presents a reconstructed view of reality, the diorama shows reality in miniature. As such, it is very versatile since illusions of perspective are quite easy to produce. In the diorama the viewer is given the feeling of "peering in" to a piece of life or nature. The construction of the diorama shell itself is designed to enhance this feeling; and by following a few simple principles and suggestions, most teachers would be

able to make a good diorama on the first try.

Diorama construction can be divided into three stages:

1. Selection of the theme
2. Construction of the frame and background
3. Construction of the scene

The theme of the diorama will probably be correlated with your course of study, but make certain it is workable before you decide on it. While almost anything visible can be made into a diorama, some scenes would be so difficult to construct in a life-like manner, that the time expended in construction would be far more valuable than the instructional value of the item itself.

Also the diorama is designed to present an illusion of reality. Be practical, if reality is at hand, don't waste time making a diorama of it. To the city child, a diorama of a farm, silo, farmhouse, and animals might be a valuable learning experience, but to the farm child it would only be repetitious.

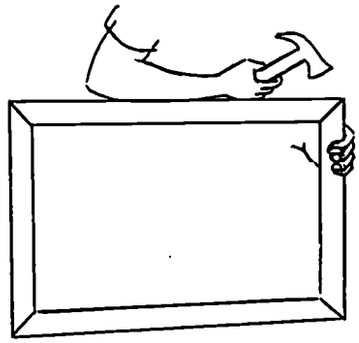
Some excellent dioramas which have been developed are dinosaurs in the rain forest, a French street scene, a farm, insects in natural habitat (in this instance the diorama would also be a life-size habitat group), and rocket launch pads.

The height of objects and models to be used in the diorama, to some extent, determines the dimensions of the diorama. However, a 2:1:1 length to height to depth ratio is a good one for school dioramas, since it preserves the "looking in" feeling and is small enough to be displayed and stored in limited classroom space. A good diorama might be 24 inches long by 12 inches high by 12 inches deep at the center back.

CONSTRUCTING THE FRAME:

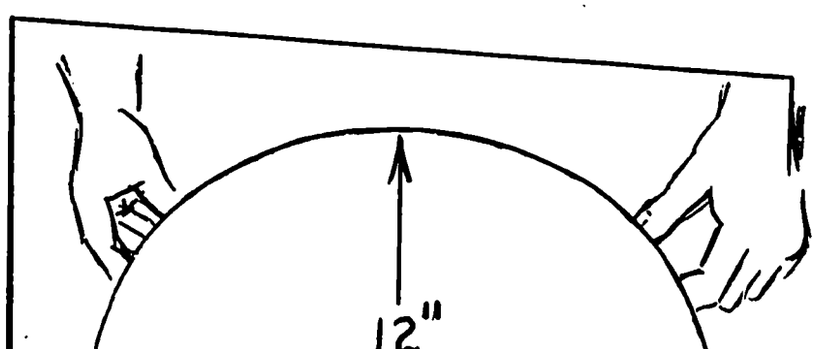
Here are the steps to follow in constructing a diorama frame:

1. Obtain two pieces of 24 inch by 1 inch by 1 inch and two pieces of 12 inch by 1 inch by 1 inch lumber.

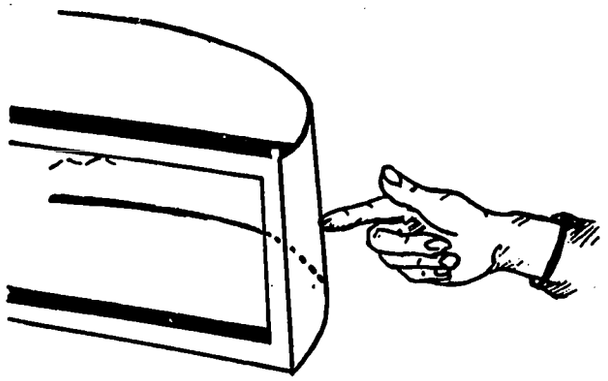


Make a rectangular frame of them with the shorter pieces placed between the two longer members.

2. Cut a curved back base from a sheet of heavy corrugated board. The base should be designed to make a regular arc to a maximum depth of 12 inches with a 24-inch cord (straight edge). Attach to the bottom of the frame.

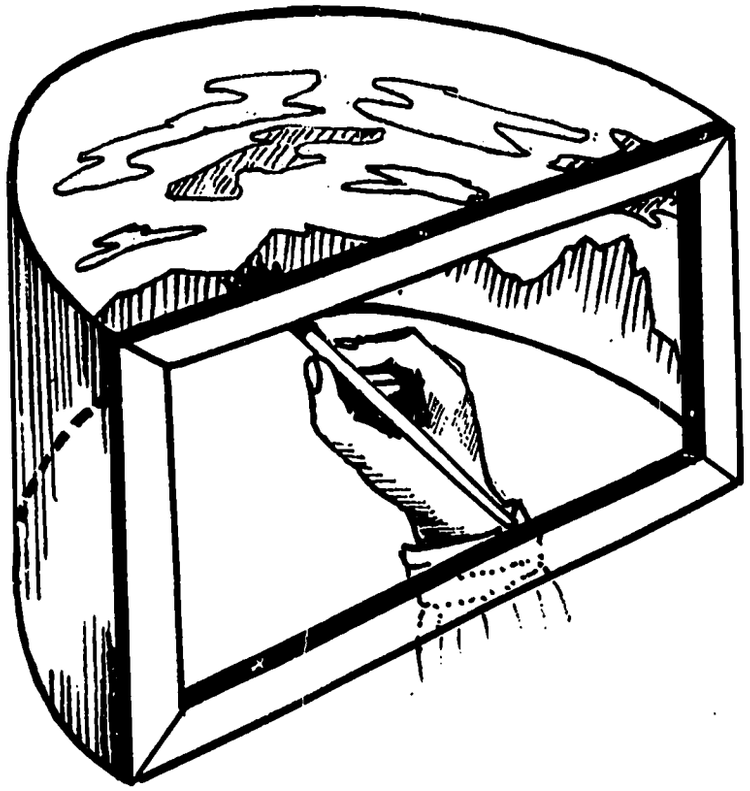


3. Attach the background strip made of flexible chipboard or tagboard to the frame. The background strip may be fastened to the base with masking tape and to the frame (short sides with staples or brads.)



After the background is attached to the frame and the scene has been determined, it should be painted to give an illusion of depth. Since the

background is curved, the farthest point in the illusory distance is the center of the background. Accordingly, any objects painted on the background should be smallest toward the center and larger at the two sides.



Water colors, tempera, or showcard can be used for painting the background. The foreground should be painted before the background is completed. The two should be blended to provide the desired effect.

Actual scene construction will be a credit to your own ingenuity both in materials to use and in manner of their use. Here are some commonly used materials:

MATERIAL	USE
Sand	road, beaches, walks
Twigs	trees
Sponge	bushes, leaves
Wire screen	land form molds

Papier Maché
Plaster of Paris ..... cover for land form molds and modeling
Dyed sawdust ..... grass
Glass
Sheet plastic
Cellophane ..... water
Pipe cleaners ..... skeletal armature for figures, shapes, etc.
Boxes and construction paper ..... buildings

CONSTRUCTING MATERIALS FOR THE DIORAMA:

There are a number of ways to construct materials for use in the diorama. With a little ingenuity, and very little effort, teachers and students can prepare materials at very little cost. The type will depend on the exhibit and materials needed. Below are a few suggestions for preparing these materials.

BUILDINGS: Buildings can be constructed from small cardboard boxes made out of construction paper, cardboard or corrugated cardboard.

TREES: Small branches and twigs are suitable for trees. Leaves may be made from dried moss or pieces of sponge.

FIGURES: Figures of animals, people, automobiles, etc., can be made from papier mache , cardboard cutouts, pipe cleaners, or painted clay.

FURNITURE: This can be constructed from balsa wood or cardboard and colored with water colors.

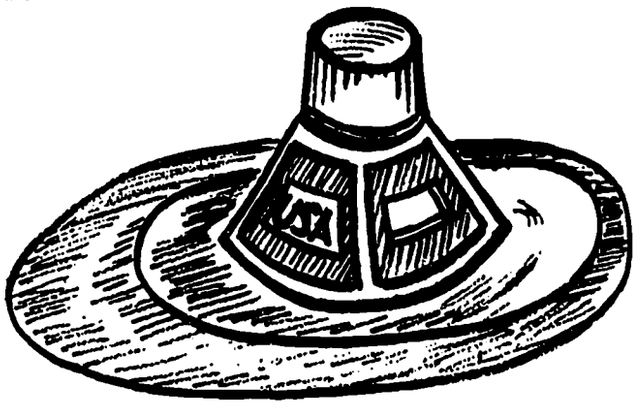
Leaves cut from paper and dipped in stained wax are good for some kinds of tropical foliage; fine sawdust, stained green, will do for grass; the furrows of a plowed field can be imitated by running a comb over a bed of wet clay; and pieces of green rubber sponge do well for shrub and tree foliage.

Also very useful are the vast variety of model railroad buildings supplies, which come in assorted sizes suited to various model railroad gauges, but ideal for diorama building. The fact that these materials (trees, bushes, houses, mountains, etc.,) are in different sizes is very valuable in creating the illusion of depth, since larger objects in the foreground, and smaller ones at the rear, also create perspective.

Models

Models can be defined as recognizable three-dimensional representations of the real thing. The thing represented may be infinitely large, like the earth, or as small as an atom. It may be in inanimate object such as a building, a monument, or a mine shaft; or it may be a living organism such as a paramecium, an eye, or the human heart. The model may represent something as intricate as a jet engine, a nuclear-powered submarine, or a spacecraft, or as simple as a number of spools on a string. It may be complete in every detail or considerably more simplified than the original.

The need for models in formal instruction is obvious. It is not always possible to bring realia into the classroom for study. So we turn to the best representation of it – the model.



A model may be scaled up, down, or equal to "life-size." It may represent part of an object, or may be an actual replica. Some models use motion to achieve their effect, others, use color, and still others depend on the elimination of all parts of a mechanism except the few related ones under study. The last type is generally called a mock-up.

Models are used instructionally in those situations where concrete visualization of three-dimensional objects is educationally desirable.

In addition to the wealth of commercially available models designed specifically for education, literally hundreds of plastic model kits are available in any large toy store. Many of these are quite suitable for instructional use and the students will enjoy putting them together.

Styrene plastic model-making from kits is vastly easier than model construction was formerly. Parts are premolded into proper size and shape. All the model maker needs to do is put them in the right place and glue them together with a special styrene model cement.

The satisfaction obtained from models has been translated into a rapidly growing industry — the manufacture of these model kits. Model kits for everything from insects to atomic reactors are available, and parents as well as youngsters take to them with enthusiasm. Most are in precise scale and many are accompanied by a manual which contains useful information on the subject. By the time a student completes putting together a model, he is likely also to have acquired a substantial amount of related interest and knowledge in the process.

In the light of what we know about the importance of sensory experiences in learning, we shall examine several characteristics of effective models for teaching purposes.

Models are three-dimensional: Most objects around us have a third dimension, that is, they have depth or thickness as well as height and width. Depth is one of the unique characteristics of models and it contributes significantly to their realism. If the third dimension is unimportant to comprehension, a model is probably unnecessary. In that case, a picture or chart may serve as well or better.

The model of the human ear is an example of how three-dimensional representation can serve instruction. By working with such a model along with an appropriate film, a chart, and related reading material, a student can gain an indelible impression of just how the hammer, anvil, and stirrup bones fit together in the middle ear and how they transmit sound vibrations from the ear drum to the aural nerve and into the brain.

Models reduce or enlarge objects to an observable size: Most of us can see only a very small portion of the earth's surface even from a high-flying jet plane; the astronauts can see much more, but even they can view only a fraction of the earth's surface at a time. With a globe, however, we have a model that enables us to picture the whole earth without difficulty. Conversely, the greatly enlarged model of an anopheles mosquito enables the Indian children to understand better this enemy they must fight in the war against malaria.

Ideally, a model should be large enough to be seen readily by the whole class. Frequently, however, the cost of large models and the problem of storage space for them enforces a practical compromise in the form of smaller models than we would like.

Models provide interior views of objects: As you lift the hood and look at an automobile engine, the impression you receive is likely to be somewhat confusing and complex because of the considerable array of subsidiary parts, wires, tubes and other paraphernalia that are required for a modern car. But such a look may be more revealing if you have studied a cutaway model of such an engine. The electric motor, the jet engine, and the giant pumps in municipal pumping stations are other examples of complex mechanisms which can readily be explained with the help of simplified models.

The advanced student, however, needs more complete models or the real thing. Students in technical or engineering schools usually have a variety of cutaway engines and models with which to work, such as diesel transmissions.

Agricultural-engineering schools test machinery of many types and frequently use cutaway models and accompanying graphics for instruction. Equipment manufacturers also use models for displays of their product, customer training, and advertising.

Models employ color and texture to accent important features: Two related instructional purposes are served by color. First, is identification of important or related parts. The second is increased comprehension of the function of operation. In addition, color may serve to make models more relevant, interesting, and in many cases more attractive. This does not suggest that color should minimize other factors, but suggests that effectively colored models give a balance in color harmony and intensity, which emphasizes the parts and functions that are important to comprehension.

The role of color in models serves primarily to enable the student to follow visually what happens. In the anatomy model, color assists understanding mainly because identification is made easily through its use. This role of color applies to models generally. Important and distinctive parts are colored so that each one stands out clearly. The colors may be natural (this is desirable on some anatomy models) but they can be brighter or otherwise changed for better visability. Parts that are not essential for understanding should be less conspicuous in color.

Varied surface texture is also used to differentiate among parts of a model. The pistons and other moving parts in a cutaway engine may be chrome plated for better visibility while other areas are left rough or unpolished. Rough and smooth textures on relief-map surfaces have significant and distinctive meanings. Texture is an important means of conveying accurate impressions from certain anatomy and biology models. Frequently colors and textures are used together with good effect.

Many models can be disassembled and reassembled: The value of models in instruction lies not only in their three-dimensional realism, but also in the fact that they can be examined by touch as well as by sight. The model can be taken apart so that each part may be examined individually. Fitting each part back in its proper position gives the student a degree of familiarity with the structure which is difficult to achieve in any other way. Furthermore, the inter-relationship of the several parts is made clearer.

Models can be created in glass: This should not leave you with the impression that, to be useful in teaching, models must be complex and expensive. Many can be made rather easily from paper and papier maché. The science materials can largely be made from paper cutouts. A papier maché volcano can erupt convincingly from a can in a cone.

Ammonium dichloride crystals are used to fuel the volcano. The crystals do not light easily; they burn slowly, spitting sparks no more than a few inches, sending up a bit of smoke, and spreading dark ashes over the top of the coné as the eruption proceeds.

Students can make small weather vanes, anemometers, and similar models

which are suitable for their needs and provide greater learning advantages than equivalent purchased models. With new, inexpensive modeling kits now available, it is quite practical for students to make their own excellent models of cells and more complex organisms.

Making your own models: The time always comes when the commercial aid is unavailable. Then you have to work out one of your own. The real key to instructional models is simplicity.

For example, the enlarged ruler is one of the simplest, but most valuable models you can make. In teaching linear measure, it is most difficult to see if all pupils can pinpoint 1 3/16 inches on their student desk rulers. But, with the enlarged ruler used as a scale model, instruction in linear measurement takes on a new dimension -- and pupil interest.

THE ENLARGED RULER: To make your own enlarged ruler, you will need a piece of light colored chart paper about 1 foot wide and 16 feet long, and a broad tip felt marking pen. If you can not get the chart paper, just use window shade material, cut into the proper width. Glue the pieces together until you have the 16 foot length. Then draw your ruler to scale on the chart roll. Use a scale of 1/16 inch = 1 inch. If you will not be teaching sixteenth's at your grade level, you can adjust your scale accordingly (e.g. 1.8 inch = 2 inches and so forth). The finished model ruler can be hung along the chalkboard tack strip or mounted permanently on the wall.

MODELING COMPOUND: A bit of ingenuity is needed in model making. Remember, you are trying to let an object represent something that it is not. Many modeling compounds are available in art supply, hobby, and toy shops. These compounds can be molded quite easily, and some will hold rather intricate detail. Most compounds have some slight shrinkage upon use, so allow for it. If molding compounds are too expensive, papier maché or paper strips can be used for making large objects.

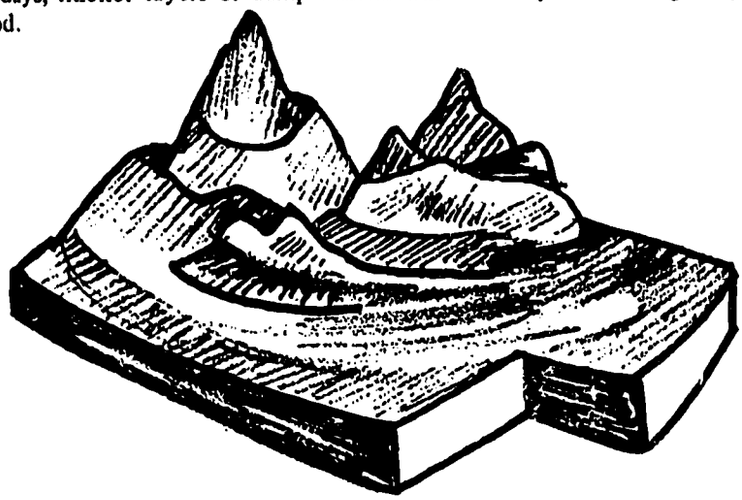
Maché is made by soaking paper pulp (or small pieces of newsprint, about one inch square) in a thick wallpaper wheat paste. The mixture should be allowed to stand, with occasional mixing, until the paper begins to disintegrate. Maché should not be applied dripping wet; it is best to squeeze out excess paste before application.

Only with very thin models should the maché be applied to the full depth of the model, since it is actually intended to be only a surfacing material – much like stucco on a house.

To achieve this goal, you will have to build up a form which is then covered with the maché. Numerous materials may be used. Cardboard boxes of various sizes and wire window screen material seem to be the favorites. If you want to make a mountain, you could set up three different sizes of cardboard boxes, and form a wire screen over them in the desired shape. The paste saturated maché is then applied to the screen mesh and manipulated into the exact shape desired.

When you have finished the shaping process, the maché should be allowed to air dry very slowly. In dry weather, a thin maché layer (½") will dry in about

two days, thicker layers or damp weather will naturally take a longer drying period.



The dried model may be painted with standard tempera paints or enamels. If tempera is used, a coat of spray plastic (acrylic) would be a worthwhile protection.

PAPER STRIPS: Some objects do not lend themselves to the papier maché construction technique. For example, if you want to make a globe, planet, or satellite, maché is useless. Instead, you can use paste saturated newspaper strips.

Cut the newspaper into strips about 1" wide and soak them in wallpaper paste immediately before use. The strips will need to soak only a short while since they should not be reduced to pulp before use.

To make a strip globe, inflate a beach ball and cover it completely with petroleum jelly. Then criss-cross the entire surface, except the air valve area, with paste soaked strips to a depth of about 1/4 inch (for a 12 to 15 inch diameter ball). After the surface is completely covered to the desired depth, allow the sphere to dry. deflate the ball and cut the globe only enough to allow you to withdraw the deflated ball. The cut may then be repaired with additional paste soaked strips.

The globe should be finished by adding two coats of epoxy paint. Or, if you seal it first with shellac, spray paint may be used.

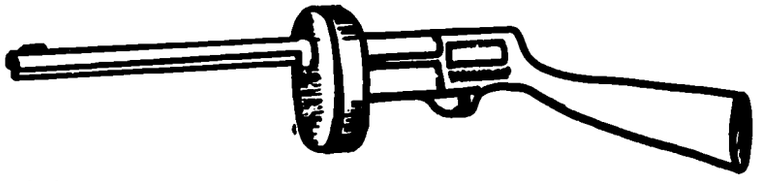
Mockups

Mockups are three-dimensional teaching devices that are useful in the instructional program. They are usually an operating model in full scale, which has been designed to be worked with directly by the learner for specific training or analysis. The term mockup suggests an imitation of a real thing, but the

imitation may or may not involve similarity of appearance, which is normally true of a model. In a mockup some fundamental elements of the real thing are purposely eliminated in order to focus attention upon others. For example, an operable electrical system of an airplane may be laid out on a large panel so that trainees can become familiar with cables and connections that normally are concealed in the fuselage or winds of the plane.

Another mockup is the drivers' trainer which secondary teachers use in helping pupils learn how to drive. A simple kind of mockup is frequently used by kindergarten and primary teachers when they have pupils build a grocery store, a flower shop, a Santa's toy shop, or a railroad train out of blocks or orange crates. The purpose of these activities is to train the children in a cooperative activity, reading readiness, or perhaps elementary number concepts.

A useful mockup used for industrial-arts classes is an electrical-wiring and fusebox installation that includes on one panel all the elements necessary for the lead-in wiring of a home. Place these various elements on one panel making it possible to show students the complete installation, parts of which are normally separated by a floor and walls. The student can see just how the installation should be made.



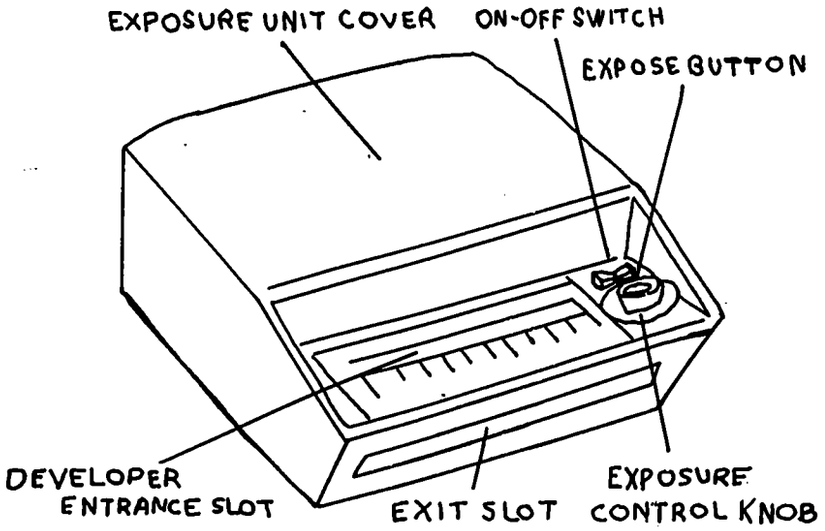
Industries use mockups for demonstrations of steps in the manufacturing processes, for analysing possible new plant layouts, for orientation of new employees, regarding inter-relationships of their work with that of others, and for self-testing demonstrations of various types.

SECTION IX

Duplicating Processes

INFRARED HEAT COPIERS: (Thermo Copiers) This machine makes use of heat applied by a lamp inside the machine. It is used to reproduce any printed, sketched, typed, or handwritten materials prepared with carbon or metal base ink. It can be used to produce a single copy, a transparency, a mimeograph stencil, to do laminating, or color lifting.

The thermal process requires a master that consists of heat-absorbing materials (pencil, black ink, or other carbon-depositing items) exposed in contact with thermal paper to heat generated by an infrared lamp. The processing time is only a few seconds and no development time is required.



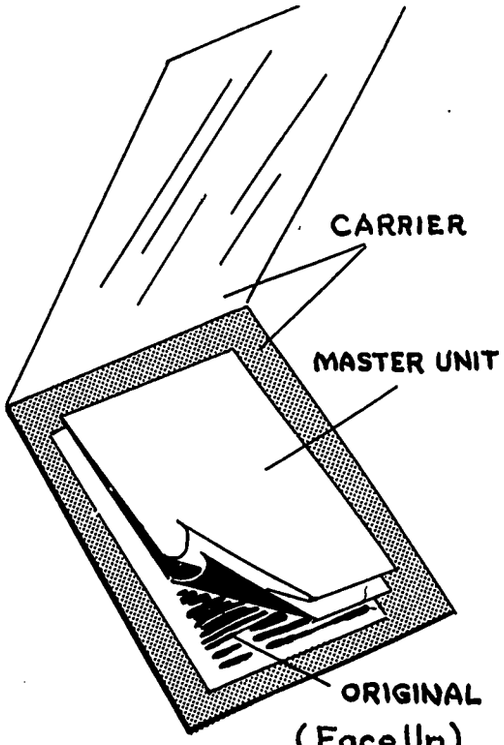
The thermal process is also useful for making spirit masters from printed sheets for normal spirit duplication. A special backing sheet with a waxed carbon surface, attached to a thin master sheet is fed through the thermal machine with the original printed sheet.

The following are instructions for making the original used in preparing a spirit master for a thermo infrared copying machine:

1. An image can be produced on a solid smooth surface using a pen or pencil.
2. If imaging with a typewriter, use a backing sheet if your typewriter platen is worn or grooved.
3. Medium inking typewriter ribbons give best results.
4. The plastic carrier should be kept free from dirt, dust and smudges – wipe it from time to time with a clean soft cloth.

The Thermal Master is prepared in the following way:

1. Remove thin buffer sheet (usually purple) that separates the thin white sheet from carbon. Place the prepared original (typed, drawn, printed, etc.) under the carbon so that the original and thermal master pass through the machine. The heat will transfer the pattern from the original through the carbon and onto the top sheet of the thermal master.
2. Place copy and thermal master in a plastic carrier. Many masters are now available with a backing sheet (usually yellow) which eliminates the necessity of using the plastic carrier. If such is used, copy must be placed on top of yellow backing sheet, but still under carbon.



3. Set the thermal heat control according to company's instructions. Even machines of the same brand and type will vary in heat controls. If copy is too light, a hotter temperature should be set on the machine. If it is too dark, the temperature should be turned down.
4. Be sure master is inserted straight in machine, in order to avoid having corners wrinkled or even torn.
5. After master has run through the thermal machine, carefully separate top sheet from carbon and mount top sheet on duplicator in the same way as a ditto master is mounted. A clear, strong impression on the back of the master will insure good copies.
6. Not all printed materials can be copied by the thermal process. The original copy must contain carbon or metal base ink. Therefore, a copy cannot be made of previously dittoed paper. Most colored printing will not reproduce either. Such materials can be dry copied (Xerox, etc.); then the dry copy can be used in making a thermal master.

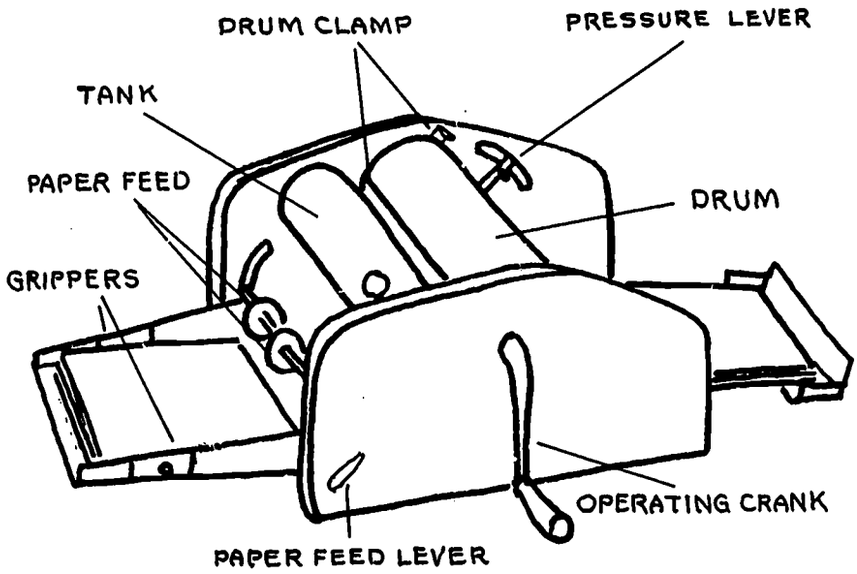
(NOTE:) The resulting master will permit up to 100 paper copies.

PRINTING THE SPIRIT MASTER:

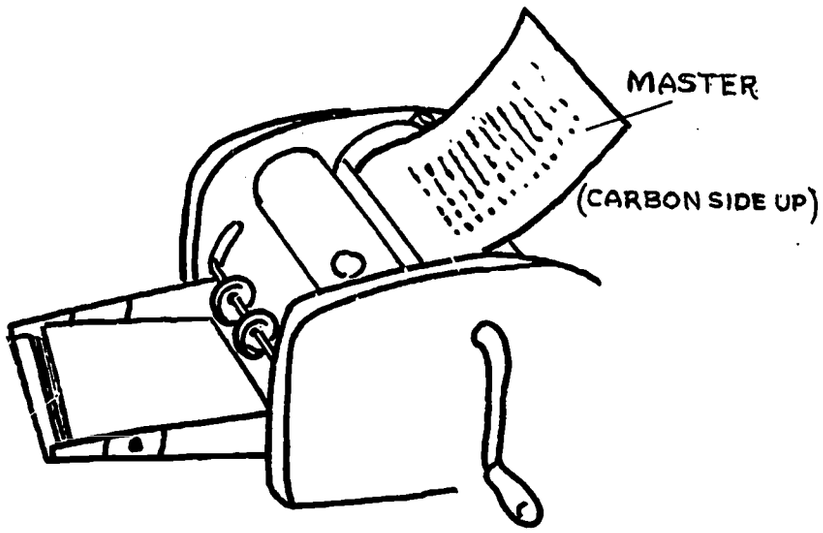
A master that has been prepared with colored carbon is placed in contact with the back side of the master paper. Impressions are made of the front side of the master and at the same time a carbon impression is deposited on the back of the master sheet.

The carbon transferred to the back of the master is an aniline dye, soluble in methyl alcohol. In the spirit duplicator, alcohol is spread over the duplicator paper. When the master comes in contact with the paper, some of the dye is deposited on the paper, producing a printed copy.

Steps in reproducing spirit duplicated sheets:



1. Prepare the duplicator: Be sure there is fluid in the tank. Adjust paper feed and grippers. Set pressure lever at medium.
2. Ready the master: Remove the buffer sheet. Tear the master from the carbon back.
3. Attach master: Turn the drum so that the master clamp is up. (Turn crank handle to "six o'clock" position.) Open the drum clamp and insert the master (with the carbon side up.) Close the clamp to normal position.
4. Run copies: Release the paper feed and turn crank, each time the drum makes a complete turn, a copy is printed.
5. Before leaving the machine: Remove the master; open the clamp and lift off master without touching the carbon. Close the clamp, set paper feed and



pressure lever to zero, turn off fluid. Replace dust cover. Keep machine clean.

One printing application of the stencil process is mimeograph. The stencil consists of a sheet impregnated with a wax-like substance that does not allow ink to penetrate unless the coating is broken, or pushed aside by a stylus, or by the force of a typewriter type, thus leaving openings for ink to pass through.

Mimeography stencils may be prepared by three processes: Self-preparation, thermal copying, and electronic scanning. The first two may be done by the teacher, the last needs to be done with a scanning machine (usually done professionally from a layout prepared by the teacher.)

Preparing hand-drawn illustrations: A teacher may draw her own illustrations directly onto a stencil. This will require a stylus, plastic drawing plate, and a mimeoscope (light table.)

To draw an illustration, place a pattern of the picture under the stencil surface but on top of the backing sheet. To prevent slipping, the picture can be taped in position on the backing sheet. The drawing plate is placed over the picture, but under the stencil surface.

Place the stencil on the mimeoscope. The light under the stencil will cause the picture to show clearly, so the teacher can trace easily with a stylus. A ball point pen can be used (but the results will not be as satisfactory and the pen may be damaged, at least temporarily.) If a mimeoscope is not available, the stencil may be held up to a window, so the light from outside will cause the picture to show up distinctly under the stencil.

The following steps are recommended in typing stencils:

1. Clean keys of typewriter for sharper lines.
2. Set the typewriter ribbon out of position so the metal letters will strike directly on the stencil rather than on the ribbon. If the typewriter does not have a way to set the ribbon out of position, the ribbon should be removed.
3. Place a cushion sheet (included in the box with stencils) between the backing sheet and the wax-impregnated top. The cushion sheet is smooth on one side, waxy on the other. The waxy side should be placed up, in contact with the stencil – wax to wax.
4. Stencils can be bought with a film sheet attached atop the stencil. Film can be bought separately and applied to stencils that do not have film already attached. The film sheet aids in sharper copy and definitely helps keep typewriter keys from becoming filled with wax filament from the stencil.
5. Insert stencil in typewriter and align. Set margins to conform with markings on the face of the stencil. Approximately 60 lines can be typed to duplicate on letter-size pages, 78-80 lines for legal-size paper.
6. Type with firm, even strokes. An electric typewriter is best for this, since it assures the same pressure for each character. Also, a standard size typewriter is preferred to a portable because the small roller on the portable prevents clear, dark reproduction.
7. Errors may be corrected by applying special correction fluid, letting it dry (requires a few seconds,) then typing the correct character with a slightly lighter touch. Neater corrections can be made if the error is gone over lightly with the rounded tip of a paper clip, before correction fluid is applied. If a large surface needs to be corrected, or if part of the stencil is torn, that portion may be corrected by preparing another stencil. The two stencils may then be cut and the two good parts glued together with stencil cement.
8. The use of stencil cement also allows a stencil to be typed vertically on a short carriage typewriter. The stencil is cut into halves, typed vertically, then cemented together. After cement has dried, the stencil can be run on the mimeograph machine.

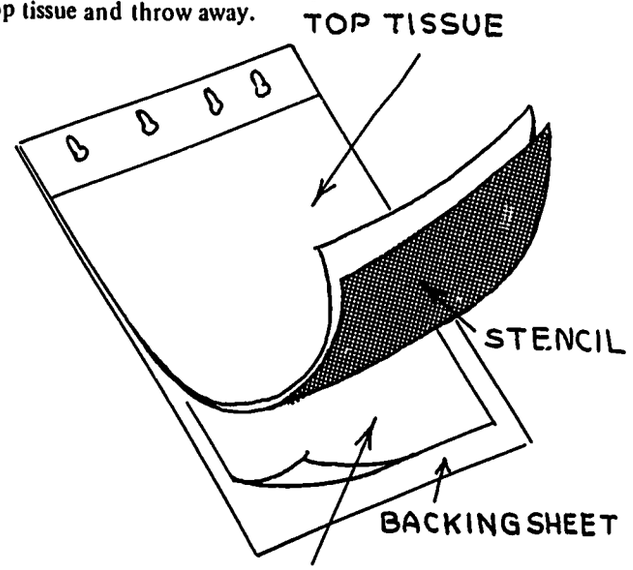
MIMEOGRAPH STENCILS THERMO COPY METHOD: A thermal stencil is prepared much like a thermal ditto master (from printed or self-prepared material run through a heat copying machine.) Up to 2000 copies may be made from a thermal stencil, whereas only about 50 copies can be made from the thermal ditto master. Again, *only* carbon base ink will reproduce.

Copy made with a soft lead pencil or typewriter will reproduce. However, if a teacher plans to prepare material originally for transferring to a thermal stencil, it is recommended that a regular mimeograph stencil be prepared instead.

If the teacher wishes to use already printed materials, the thermal method is preferred to the teacher having to spend time in typing a stencil.

Steps in cutting an instant stencil:

1. Make certain that the belt and rollers of your thermo copy machine are clean.
2. Place the original copy between stencil and backing sheet, face up, and below the top edge paper guide.
3. Set your thermal copy machine at medium speed (dark.) (Testing will be necessary to determine the correct exposure.)
4. Smooth out top tissue and insert the complete unit into the machine.
5. Tear off top tissue and throw away.



6. Carefully peel stencil from the original.
7. Attach your stencil to duplicator in the normal manner.

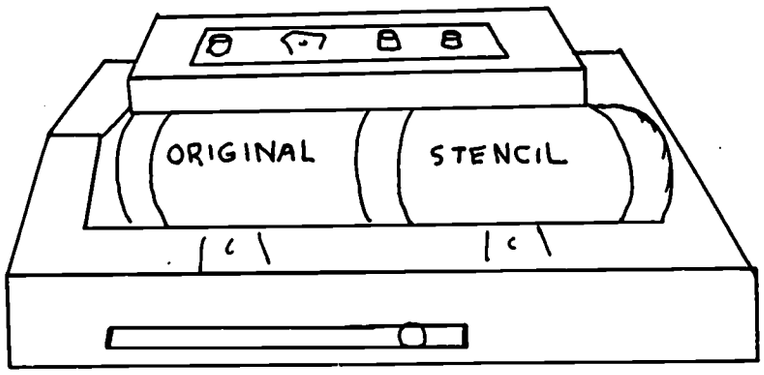
(NOTE:) If the copy is too light, reduce speed of the machine. If too dark, increase the speed.

An **ELECTRONIC STENCIL** is scanned from material prepared by the teacher, who pastes up a layout of line drawings, lettering, or even photographs.

Rubber cement or spray adhesive may be used to attach layout material to a white sheet of paper. Either 11-inch or 14-inch length paper may be used, but a half-inch margin should be left on all sides.

The layout may include a page of material to use at one time, or it may be a variety of material to be cut apart and used separately. The layout is then sent elsewhere to be electronically scanned, if the school does not have its own scanner. The scanning machine prepares, by electronic beam, on a stencil, an exact reproduction of the layout. If the layout includes material that a teacher wishes to duplicate all at one time, the electronic stencil can be mounted on the mimeograph machine. In this case, the teacher should specify on the layout what type of machine will be used. The layout will then be scanned on a stencil that will fit the school's mimeograph machine. (Different brands of machines require stencils with a particular hold pattern at the top for mounting. AB Dick Stencils, for example, will not fit Getstetner machines, and vice versa.)

If the layout includes several different illustrations, or other material to be used on separate assignments, the following steps may be used to attach portions of the electronic stencil to allotted places on the typed or handwritten stencil:

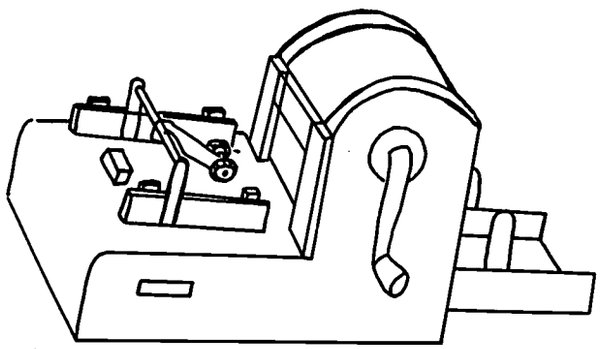


1. When preparing typed or hand-drawn stencil, leave area blank where electronic illustration will appear.
2. After stencil is typed – all corrections made – and removed from machine, cut area out of typed stencil, just large enough for the scanned illustration to appear. The illustration is then cut from the electronic stencil with enough margin on all sides to slightly overlap the typed stencil. Stencil cement is applied around the edges of the hole cut in the typed stencil and the illustration is adhered. (CAUTION: To prevent cement from sticking to the stencil and the backing sheet, scrap paper can be placed between the two, cement applied around the hole, and scrap paper removed. Thus, the scrap paper will contain any excess cement.) As soon as the illustration is stuck to the stencil, the stencil should be lifted carefully from the backing

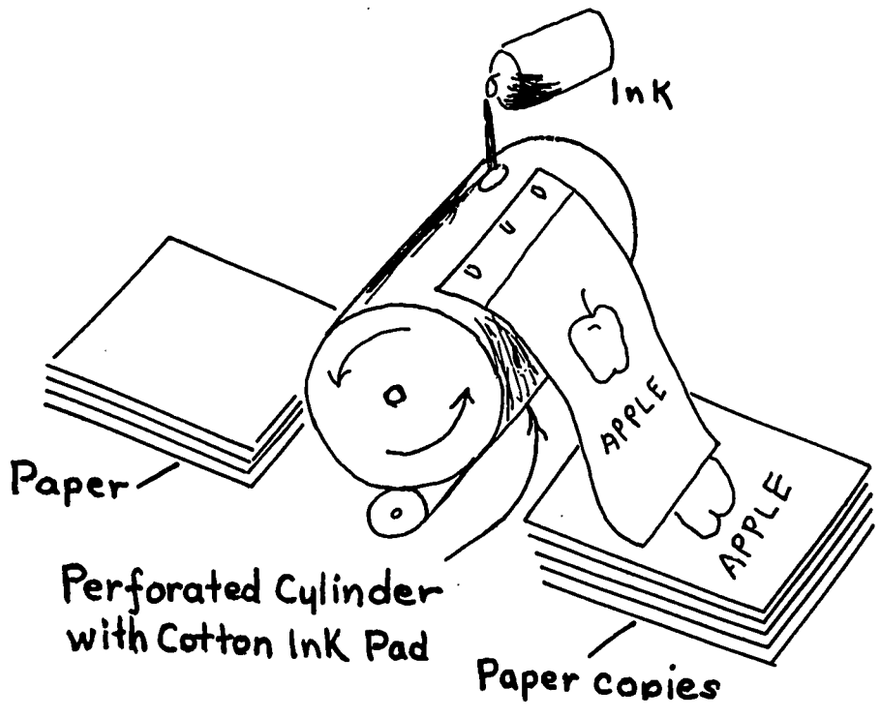
sheet until the cement dries. This is a further safeguard against the stencil sticking to the backing sheet. As soon as the cement is dry, the stencil can be run.

OPERATION OF THE MIMEOGRAPH MACHINE:

1. Check the ink supply. Most machines now come with a closed drum which contains paste ink. A metal dip stick is supplied for checking the ink supply, much like that used for checking the oil in an automobile.
2. Attach stencil by placing it face down over the drum cylinder. Slip the stencil top over the cylinder hooks and smooth the stencil down by rubbing hand over the backing sheet. Clamp the bottom of the stencil into place, then detach the backing sheet at the perforation at the top of the stencil.
3. Turn machine on and allow cylinder to rotate a few times to ink the stencil evenly. Run a few trial copies to absorb excess ink and make any adjustments in margins – up and down, sideways – as needed.



4. Set counter for number of copies desired.
5. A stencil may be used again. If this is desired, remove the stencil carefully from the machine and place between lengths of paper towel material and roll. Place a copy of the material on the outside of the rolled stencil for easy identification purposes.
6. Leave machine in proper order by placing a protective cover sheet over the ink pad on the cylinder. Seal it carefully by putting machine "in gear" and running about 10 sheets of blank paper through the machine. The cover sheet will prevent ink from getting on the paper, while the paper will cause the cylinder to press against the roller on the machine, thus sealing the cover sheet tightly to the cylinder.
7. Stop machine and place cylinder at "Stop here" position (for sure!) and replace dust cover.



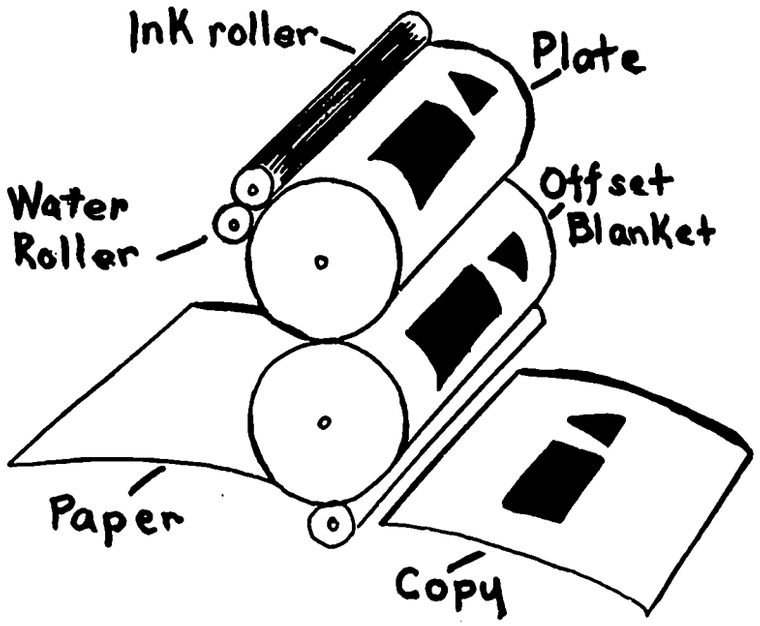
OFFSET PRINTER:

Versatility is one of the advantages of offset printing. Although more complicated to operate than the mimeograph, the offset machine can produce copies that look as professional as printing itself. The basic principle of offset is that ink and water do not mix. Copy can be prepared on paper masters or metal plates. A water roller on the press coats the master or plate with a thin layer of water. Ink adheres to the image on the master, but water will not. The ink is then transferred, offset onto a cylinder covered with a rubber pad (blanket.) The image transfers to the paper as it passes under the blanket.

Material for offset printing may be prepared on paper masters or on a metal plate. The master or plate is attached to the machine and copy is reproduced. Because the operation of the offset is more complicated than that of the ditto or mimeograph machine, the offset should be operated by a competent person. However, almost every teacher can prepare materials for offset printing.

A Paper Master can be prepared by typing, however, writing or drawing can be done with a pencil or a special drawing pen. Non-duplicating pencils

can be used for sketching before the final drawing is done, if the teacher desires.



Corrections can be made on the master with a special eraser, which looks much like the pencil-type typewriter eraser. Erasures should be made lightly and as clean as possible. Most smears will "wash out" when the master is being run on the machine. A light pressure should be set on the typewriter. A heavy impression tends to cause the letters to print with a ghost line in the middle. An electric machine can usually be set for a very light pressure. For consistent printing, an electric machine is recommended for typing, for the same reason that the electric typewriter is recommended for typing a stencil.

A Metal Plate is prepared by using a negative made of a layout. The teacher can prepare a layout page of typed material, illustrations, or whatever she wishes to use. A negative is made of the layout. If the teacher wishes, the layout can be enlarged or decreased in size when the negative is made. If the school has facilities for burning the negative onto the metal plate, the negative and layout are returned to the teacher. If the school does not have the equipment for burning the plate, the teacher will need to have the "negative preparer" made from the plate. Then the plate, along with the original layout, is returned to the teacher, ready to use.

Although offset printing with paper masters is not much more

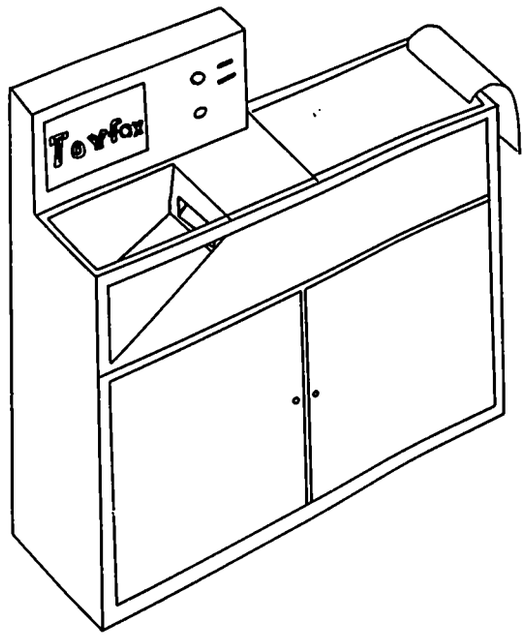
expensive than mimeograph printing, printing by using metal plates can be rather expensive.

Offset printing may not seem too feasible for normal classroom use, but can cut budget costs tremendously when compared with the cost of commercial printing for school forms, report cards, business letters, etc.

Many school journalism departments use offset printing for preparing school publications. Pictures, advertising, cartoons, etc., can be expertly reproduced by this method.

ELECTROSTATIC COPIER:

This machine is useful in reproducing single copies of printed materials. Although it copies any visible color, it produces in shades of black and white only.



There are two related processes under this category-Xerography and electrofax process. Both require charged surfaces that are affected by light. The charged area will hold a substance to create the image.

The electrostatic machines are easy to operate but expensive to purchase. (Some are leased on a per copy charge.) Copies are of fair to good quality.

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