

SOME DEVICES AS CLASSROOM
AIDS IN GEOGRAPHIC INSTRUCTION

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By

ERNEST MCHUGH

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APPROVED BY:

David C. Winslow
Chairman, Thesis Committee

Robert C. Fite
Member of the Thesis Committee

Edward S. Kess
Head of the Department

A. C. McIntosh
Dean of the Graduate School

250880

PREFACE

Each day we are becoming more and more worldly minded and geography conscious. Any aid for teachers who are responsible for opening the field of geography to the children of today will help increase the understanding of geographical concepts to civilization, and help growing citizens realize that geography is the adaptation of man to all of his environment.

The importance of visual classroom aids in geographic education has stimulated the preparation of this thesis. The writer has selected for presentation the following devices: globes, Dioramas, Panoramas, figurines, paper mache fruits and vegetables, maps, stencil prints, and the use of chalk. They were selected because they were easy to construct and simple to understand. Others were omitted because of complexity of construction, expense of materials, or time required for preparation and use. They are suggested as supplementary tools for teaching on a secondary level. A few such as the stencil prints are applicable for elementary teaching. They should not be substituted for a textbook. Information and methods were gained by preparation of the devices and personal interviews with teachers. A supplementary bibliography is given for those who desire additional information on aids and their uses not covered in this study.

The writer is indebted to Dr. David C. Winslow and Professor Robert C. Fite of the geography staff for supervision and encouragement during the preparation of this thesis; to Dr. F. Atherton Riedel, Professor Ray L. Six, and Superintendent Leona Absher for their helpful assistance in gathering and preparing the material. For numerous bits of information and aid, the writer is especially indebted to Myrtle C. Schwarz, Assistant Professor of Education, and her classes during the summer of 1949.

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CHAPTER I

INTRODUCTION

Today's typical teacher of geography overlooks most of the numerous, helpful and effective teaching devices that are available for his use. The purpose of this study is to bring to the attention of teachers of geography and related subjects a selected number of teaching devices that will be helpful in these subjects. Not all the available techniques are treated; rather only a few of them that are considered most helpful, inexpensive, and simple to carry out.

Each of the chapters, from II to IX inclusive, relates to a specific device for teaching, while Chapter X briefly comments on six additional devices not handled in individual chapters.

Paper mache preparations are discussed in Chapters II, V, VI, and VII; dioramas and panoramas in Chapters III and IV, respectively; paper and cloth prints in Chapter VIII; chalk illustrations in Chapter IX; and additional devices in Chapter X. They offer opportunities for more widespread use of teaching techniques which are frequently overlooked, by utilizing the individual talents of the pupils.

Teaching effectiveness varies directly with the suitability of the learning situation. The desirability of the learning condition is enlivened when, under proper guidance, the students are dependent on their initiative, creativeness, and skillfulness in carrying forward the lesson plans. The increased amount of geographic learning which pupils gain from active participation is enhanced by the added feeling of self expression, self confidence, and satisfaction.

Paper mache preparations provide the pupils with the chance to actually

get their hands on the subject.¹ Literally speaking, they can grasp the material. The cleaning up, necessitated by the small amount of paper and paste that is scattered about the room, is more than offset by the enjoyment and relaxation found by the pupils in their own creativeness and resourcefulness. The geography classroom can be a place where students desire to be, rather than where they are required to go.

The Diorama and the Panorama offer an opportunity for the children to learn to use reference books and the school library. Pupil resourcefulness is utilized in all stages of preparation, acquisition of materials, and oral presentation of the subject. The child gains invaluable knowledge in the use of the library and acquires worthwhile practice in organizing material in a logical, sensible sequence for oral or written presentation. Pupils should be permitted to expend their surplus child and adolescent energies in preparation and presentation of lessons rather than to create class disturbances.

The preparation of paper and cloth prints presents a splendid opportunity for the members of a class to become more intimately acquainted with the shapes and colors of the features in their natural surroundings. Wild fruits, flowers, water plants, animals, and fish are some of the natural features with which most of us now have only a slight acquaintance.

The "open stencil" can readily reproduce shapes and colors of plants, animals, leaves, or crops; all of these are suitable subjects for hand stencils. The "closed stencil" is of great value in utilizing information gathered by small groups of students in library studies for presentation

¹ Paper mache consists of a combination of paper hanger's paste and paper. The paper is either in small narrow strips and used as a material for molding or in larger sheets used to make figurines.

to the class. Students, when their energies and interests are properly channeled into action, will create their own desirable and effective learning situations if the teacher will present the subject as a topic for investigation and study rather than as a group of facts and figures. Teachers should remember that they are not merely teaching a class group but guiding a number of individuals.

Chalk illustrations, either white or colored, provide a very effective method of supplementing the materials for the textbook through the use of graphs, diagrams, and outline pictures drawn on the blackboard. Large scale maps, portions of maps, or simplified drawings may be made. Teachers who utilize colored blackboard illustrations, find the pupils resort to colored pencils and crayons to make miniature reproductions in their own notes. In addition, they will eventually volunteer or readily undertake the preparation of chalk drawings on the blackboard or other drawing surfaces for class use.

The five devices treated in the last chapter are all techniques that require participation and cooperation of the entire class either in group activities or as a single unit; they are:

1. The Class Contributions File
2. The Use of Living Materials
3. The Geography Hall of Fame
4. Metal Tray Mud Maps
5. Handmade Lantern Slides

The interest of the children may require some original stimulation, but once a class project is underway the problem becomes one of limitation of time and contributions. The rule is that no technique should be allowed to consume more time than is proportionate to the learnings acquired.

Teaching geography means more than developing facts and figures from the textbook alone. Such information is already available to the students. Teaching geography, on the other hand, does include stimulating the interests and fostering the resourcefulness of pupils so that they will use their own initiative and ambition, under effective guidance, to discover some of the geographic learnings that are available in other textbooks, in their natural surroundings, and in the library.

Every student is an individual and will respond individually to the learning of geographic knowledge that is adapted to his individual abilities and to his previous knowledge. It is necessary to develop situations to accomplish the results that fit the diverse capabilities of the class.

The work periods for construction of these recommended teaching devices should be orderly, but not periods of absolute silence. Open-minded opinions and free expression are important contributing factors to the over-all learning of the pupils. Freedom of cooperation and discussion eliminates the rigid, disciplined feeling that accompanies the traditional teaching methods. Pupils are in reality authors who tell their stories with paper and paste rather than with pen and ink. They are proud of what they have accomplished and what they have learned; they wish to tell others about their work. A warm feeling of self-importance in the pupil is desirable if he is to give wholeheartedly of his energy and talent.

Geography is not a dry subject, but a living science that is most satisfactorily approached by group participation in the creation and interpretation of selected teaching devices.

CHAPTER II

THE PREPARATION OF GLOBES AND OTHER SOLAR BODIES

Paper Mache Construction Methods

The preparation of globes and other solar bodies out of paper mache strips (Fig. I C) has two general objectives; first, to construct a globe representative of the earth and other bodies of the universe, and second, to present some generalizations concerning the knowledge of heavenly bodies and their location in relation to the earth and sun.

Details for construction of a globe and other solar bodies are simple. The first thing that must be done is to make a collection of needed materials which include: (1) an ample supply of water and a large mixing bowl for making paste, (2) at least a one-pound package of wallpaper paste, (3) about two pounds of clay that is easy to mold, (4) a series of various sized bowls, nesting bowls serving satisfactorily, (5) a stack of old newspapers both colored and black and white, and (6) a variety of poster paints and some water color brushes.

The second thing to be done is to decide what size of globes you wish to make as representative of the solar bodies. Here are the dimensions of the various planets; all the figures are rounded off to the nearest five thousand miles for numbers above 25,000 miles and the figures are given as the diameters of the bodies.¹ The planets are listed in order of size. The right-hand column shows the diameter of each planet to be constructed:

¹ Encyclopedia Britannica, Vol. 17, 1948, p. 997.

<u>Name</u>	<u>Diameter</u>	<u>Size in Inches</u>
Jupiter	85,000 miles	15
Saturn	75,000 miles	12
Uranus	30,000 miles	5 plus
Neptune	30,000 miles	5
Earth	8,000 miles	$1\frac{1}{2}$ plus
Pluto	8,000 miles	$1\frac{1}{2}$
Venus	7,000 miles	$1\frac{1}{4}$
Mars	4,000 miles	$\frac{3}{4}$
Mercury	3,000 miles	$\frac{1}{2}$

The order of nearness to the sun is: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.

The technique of construction is a simple task that may be carried out satisfactorily by the students in any grade beginning with the fourth. Take strips of paper and paste them in a series of layers around the various sized bowls, building them up until they are representative of the relative sizes of the solar bodies. At least eight such layers of paper and paste should be applied and then allowed to dry. The resulting hardened shells are then removed from the bowls and the two equal-sized halves are pasted together to form a fairly representative sphere. After having been allowed to dry again, they are painted a variety of colors and suspended in mid-air or layed out in some preferred manner that will aid the students in learning about our universe.

A more detailed elaboration of the technique is as follows:

1. Tear the newspaper into strips varying in width from $\frac{1}{2}$ inch to $\frac{1}{2}$ inch for the five smallest globes to be made, and from 1 to 2 inches for the larger globes.

A

Paper Mache Map of
South America

B

Figurine

C

Solar Bodies

FIGURE I



2. The bowls must be made fairly round by building up the flat base with wet, small, paper strips. Take some of the smallest strips of paper and soak them in a pan of water, then build up the flat base of the bowl with them until it looks well rounded. The clay is rolled out into a flat layer, like pie dough, and layed over the bottom of the bowl covering the wet paper and extending about half way down the sides of the bowl. You should now have a fairly representative hemisphere.

3. The paper strips are now ready to be put on the base which you have prepared; but first, the bowl must be thoroughly greased so that the paper shell will not stick fast, as it must be removed later. The first layer of paper to be applied consists of plain wet strips and there is at least two thicknesses of them. This covering is to keep the pasted layers from coming in contact with the surface of the bowl. You are ready to construct the heavenly body with strips of paper and paste.

Mix wallpaper paste with water to a consistency of medium thickness so that there will be no lumps. The paper strips and paste are next added, using the size of strips that may be applied quickly and with the smoothest surface. Be careful not to get too much paste on your paper or to leave air pockets between the succeeding layers of paper. At least eight layers of paper strips and paste should be added to the original layers of plain wet strips. By using alternate layers of colored and white paper it is easy to tell when one complete layer has been applied. The color of the last layer is not important as poster paints will color either one with equal effectiveness. The hemispheres are now ready for drying and should be exposed to wind and sun to speed up the drying process. Of course the time required to complete the project may be cut nearly in half if two sets of bowls are used and both halves of a sphere are prepared at the same time.

The time required for drying varies with the size of the object, the number of layers of paper, and the weather conditions. During the dry periods when evaporation is at a maximum, drying will take about three days for the small balls and up to five days for the larger ones. When the weather is rainy and damp it may take over two weeks for the largest shells to dry.

4. The five smaller bodies, Mercury, Mars, Venus, Earth, and Pluto, may be constructed around small balls of the required size, or clay may be worked into balls and used as base objects. These smallest balls require from four to eight layers of paste and paper strips. The base object is greased and two thicknesses of wet paper are applied before the paper and paste.

5. The paper shells should be thoroughly dry before they are removed from the base object. Removal is accomplished as follows:

- a. The hemispheres around the bowls are loosened by inserting the blade of a knife around the lip of the bowl and the shell easily slips off.
- b. The complete spheres around the balls of clay are cut in half by using a single-edge razor blade; these halves will then slip off easily. The equal-sized halves are now pasted together with the same type of paste used in construction by putting a few strips of paper around the middle where the halves are fitted together. The completed spheres are now allowed to dry for another day and they are ready to be painted.

6. Paint is added after the paper shells are absolutely dry. The paint should be mixed to just a little thicker consistency than usual so that a covering of the paper will be complete. Contrasting colors should be

used, making it possible for one to easily differentiate the smaller balls. If it is desirable, a few meridional and parallel lines may be added to the sphere that represents the earth so that its different portions can be easily recognized.

Class Use of Paper Mache Globes

Maximum contribution to the knowledge of the class may be gained by arranging this completed universe in some manner that will depict relative positions of the bodies in the solar system. One very good method is to arrange them around some centrally located light in the room according to their relative distances from the sun. Even though distances are so great that they cannot be accurately represented, it is still possible to gain an idea of the relative position of the sun and the planets in the universe. Such a setup as this will ease the task of the teacher, when he attempts to explain the advantage of location that the earth enjoys in the universe. The spread of the planets around the light should be encompassed by an imaginary circle not less than sixteen feet in diameter.

There is much to be learned from such an arrangement of these heavenly bodies. Some things that should be learned indirectly through discussions and observations are: (1) relative sizes of the solar bodies, (2) distances of the solar bodies from the sun, (3) relationship of the solar bodies to the sun, and (4) geographic significance of the earth's solar location.

At this time it would be relatively easy to explain some things primarily relating to the earth by using a large globe to demonstrate what happens as the earth revolves about the sun, rotates and tilts on its axis. Particularly such facts as they influence seasonal changes are of value at this time.

No special skill is necessary to perform any of the duties required to prepare this model of the solar system, and the entire class will benefit from the opportunity to creatively use their hands.

Alternative Methods of Preparation

There are several ways of making models that are unique. A few of these alternative methods are:

I. Make your decision as to what sizes of bodies you want, then purchase rubber balls that are the required size. The balls can be painted and used satisfactorily. Balls are not too easily suspended as the larger ones are usually too heavy.

II. Another method is to reduce the size of the bodies so that each one may be represented with a clay ball.² To reduce the size of the ball required for the larger spheres, it would be advisable to reduce proportionately the sizes of the four larger balls, as they are in a group to themselves. Though accuracy will not be perfect, the impression of size by comparison to the other bodies will still be satisfactory.

III. A very easily constructed method of showing the solar system, but not in relative location, is to cut pieces of pasteboard to relative size and paste them on a large sheet of drawing paper according to their order from the sun.³ No regard is given to showing comparative distance from the sun. Lines are projected to the left side of the mount and on these lines are written, in arabic numerals, the distance of each body from the sun.

² F. A. Riedel, Personal Interview, Department of Physical Science, Oklahoma A. & M. College, December 5, 1949.

³ Mrs. Lloyd Bateson, Personal Interview, June 14, 1949.

A plate such as this is used by drawing a sun in one corner of the blackboard and hanging the plate so that the projected lines point to the sun.

Conclusions

The paper mache method originally discussed at length can be used best in the fourth to eighth grades when the pupils should be gathering basic concepts of geography to carry with them through the rest of their lives. The grades above the eighth should utilize one of the quicker alternative methods as the students can more easily conceive the idea of the universe without having the model system in front of them.

The preparation of the solar system, if undertaken as a class project, will consume from six to eight hours of class time; this period may be scattered over two or three weeks.

The knowledge gained by the children will be well worth the time spent, as basic ideas of our universe and its effect on us provide concepts of geography. Such knowledge also will aid future studies in the earth sciences and will provide a better understanding of the world in which we live.

CHAPTER III

THE PREPARATION OF DIORAMAS

The Diorama and Panorama Differentiated

The Diorama and the Panorama are model exhibits that tell a story, much as a picture tells a story, only possibly more effectively. Newkirk has this to say about the difference between the Diorama and the Panorama.¹

The two types of construction portray subject matter in different ways and for different purposes, but they may be used to supplement each other.

The Diorama may be thought to be a picture in three dimensions with emphasis on a center of interest. As a picture, it needs to be framed in some way, and it is usually built into some sort of box or case. The Panorama, as used in schools, is not a picture, but is in the nature of a model, and, as such, is laid out on a flat surface without perspective.

The subjects treated in the two differ considerably in scope. In the Diorama, since a specific center of interest is treated, everything else is subordinated and put into perspective. Thus, most of the mountains, forests, and other parts of the general scene are shown in the background. On the Panorama, on the other hand, the purpose is to show a birds' eye view of a territory, sometimes of considerable extent, which may include farms, hills, forests, rivers, and human or animal figures all in approximate proportionate sizes but not in perspective.

Diorama Construction Method

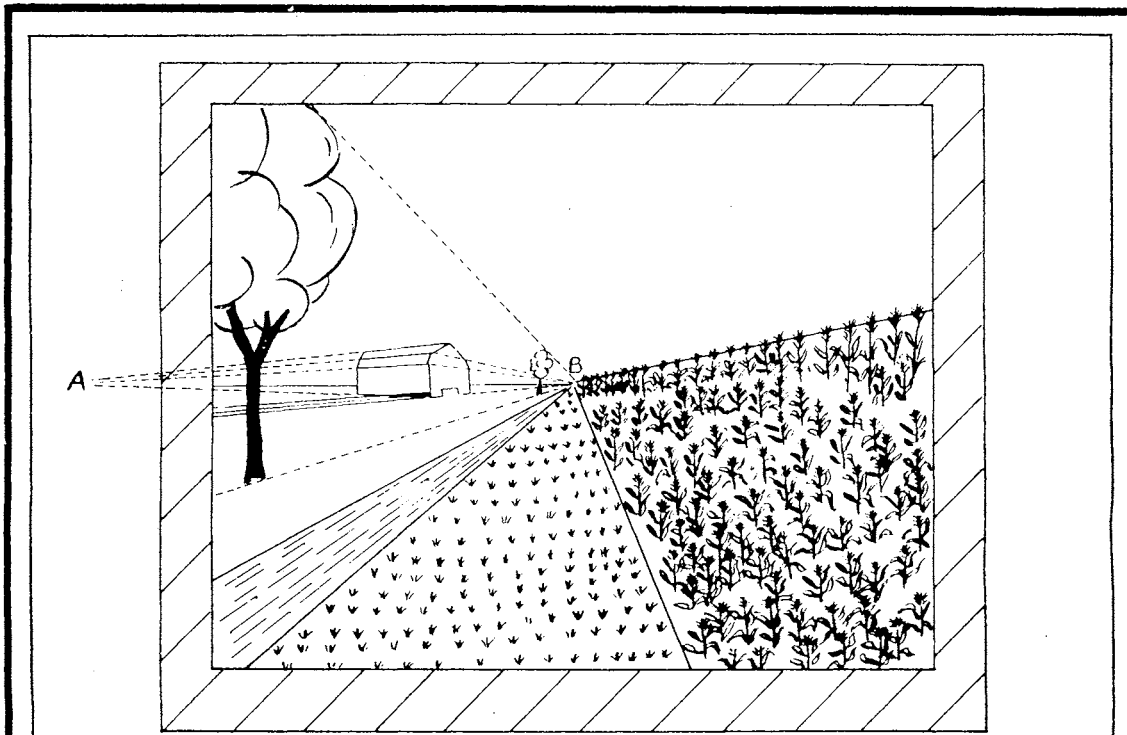
"There are two principal types of Diorama layouts: those having a curved background with a two-point perspective and those having a straight-sided background with a one-point perspective."² (Fig. II A, B).³

In the classroom, as a rule, the matter of an accurate perspective or

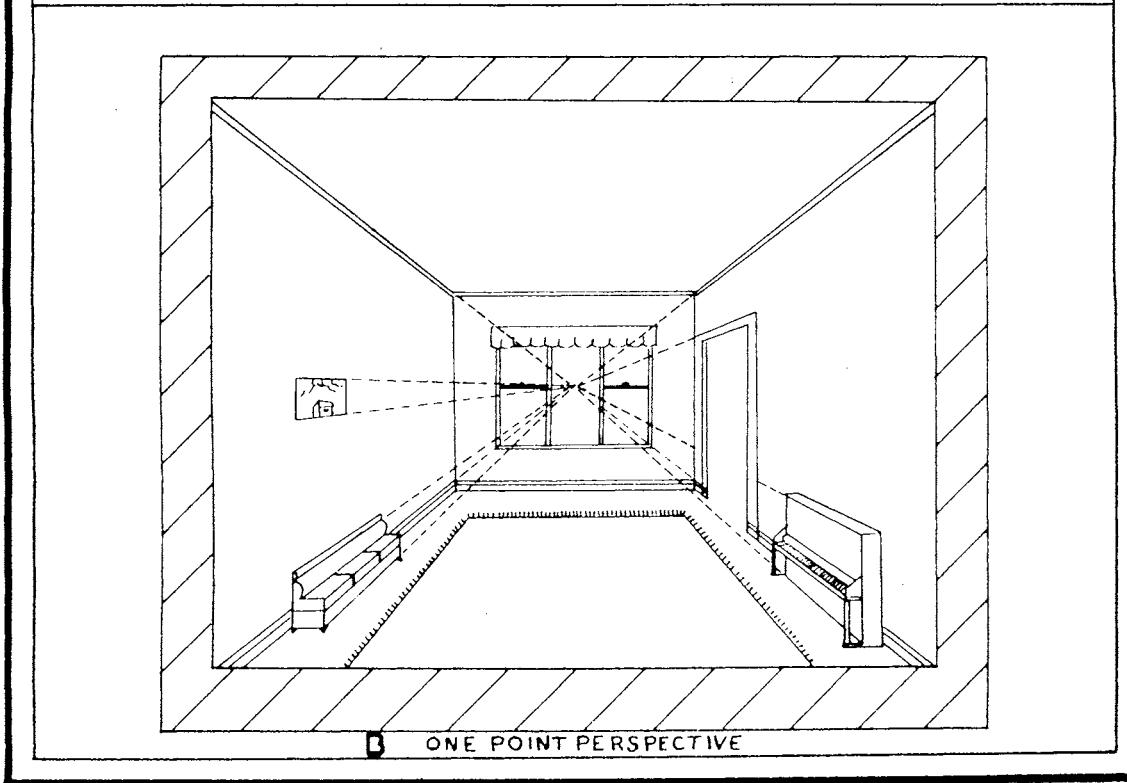
¹ Louis V. Newkirk, Integrated Handwork for Elementary Schools, p. 227.

² Ibid., p. 222.

³ Ibid., p. 228.



A TWO POINT PERSPECTIVE



B ONE POINT PERSPECTIVE

FIGURE II

absolutely proportionate models is subordinate to the objective of the lesson. Too much time would be required to make each item relatively exact when a reasonable degree of accuracy will provide an equally suitable accomplishment in learning.

The selection of the subject is followed by the preparation of the frame. The subject will determine the size of the frame to be used. Many good ideas will be lost if the frame is too small for adequate presentation of the subject. The size of the frame may vary from a match box to an apple crate or even slightly larger boxes. An apple crate has suitable proportions and is easily adaptable to most projects. Match boxes, cracker boxes, shoe boxes, lemon crates, and almost any other type of box can be adapted to other size presentations. "A practical size is 22 inches by 12 inches by 15 inches or something near these proportions."⁴

The background of the Diorama first should be constructed so that the proper models, colors, and proportions can be produced in the foreground. The type of background depends on whether a single or double perspective is desirable. The background may be colored with crayons, water colors, or poster paints depending on the availability of the coloring materials. "White drawing paper ..., colored cardboard, muslin, or the wrong side of a piece of oil cloth all may be used as a base for the background."⁵ When using a one-point perspective, the side walls are decorated to fit the subject. The back wall may be painted or carved with suitable materials.

Plaster is the best base for a Diorama requiring mixed surface features as hills, walls, curbstones, streets, sidewalks, etc. Regular wall plaster

⁴ Ibid., p. 231.

⁵ Ibid., p. 234.

is suitable if mixed with equal portions of water and vinegar to reduce the rapidity of hardening. Four particular advantages of such a plaster base are:⁶ (1) it can be carved with a knife or chisel, (2) it can be easily built up by adding more plaster where it is needed, (3) objects can be imbedded in it before it hardens, and (4) it can be readily discarded. However, the floor of the box used as a frame generally is suitable as a base without the plaster unless unusual beauty and precision are desirable.

The foreground scene is constructed on the base, and forms the center of interest. Details of importance should be selected and placed in areas without congestion. "An overcrowded scene is neither attractive or effective."⁷

A typical Diorama that may be used to illustrate the geography of Oklahoma is one of an oil field (Fig. III, G) with emphasis on the underground structure as well as the surface features.⁸ The representation will have to be diagrammatic, but a general idea of oil field construction and operation can be learned. It should be mentioned that oil pools are often found in an anticlinal structure, usually a dome structure, that oil is also found under other conditions, and that the anticline is just the most common source.

The occurrence of oil as a general rule in the anticline or bridge formation has previously been mentioned. One objective then is to teach the relationship of the oil field above the ground to the oil source beneath. Another is for the pupils to learn some of the geologic and

⁶ Ibid., p. 237.

⁷ Ibid., p. 234.

⁸ Ernest McHugh, "The Diorama as a Device for Geographic Instruction." Research paper read before the Geography Section of the Oklahoma Academy of Science, December 2, 1949.

geographic terms that are associated with the separation of oil from the earth. The eventual conversion of petroleum into the products which we use naturally should be considered.

The materials used for construction of the Diorama are:

1. Common wall plaster.
2. Water.
3. Newspaper or writing paper.
4. Small malleable wire.
5. Two balloon sticks and some toothpicks.
6. A sheet of drawing paper large enough to use as a background.
7. Quick-drying cement.
8. Poster paints and brushes.
9. A frame made out of pasteboard and cut to size, or an ordinary pasteboard box of suitable proportions.

Actual construction starts with the preparation of a plaster cast to represent the underground structure. The size varies with the dimension of the front of the display frame, and how much of the structure it appears desirable to show. The rock strata, gas pocket, and the oil pocket may be demonstrated in less space than is required to show the water relationship, but its bearing on the function of the oil trap is very important and should be explained.

Mixing the plaster is not a difficult job and may easily be accomplished in a few minutes in either of two ways:

1. Pour water into a mixing bowl and slowly sprinkle the plaster on top of the water. You will notice at first that the plaster powder sinks rapidly to the bottom and as you continue to add more plaster the speed of sinking becomes slower and slower because the water

loses its ability to dissolve additional powder. Powder must be added until it no longer sinks, but floats and appears to form small islands on the surface of the water. Once the plaster is stirred it must be poured immediately; if not stirred it may be allowed to set for a few minutes. This method permits the simultaneous mixing of the plaster and the making of the frame to be used as a mold. This is possible because the plaster may be kept for a few moments if the mold is not completed. When needed, the plaster is stirred to the consistency of thick gravy and poured immediately and allowed to harden.

2. Pour water into a mixing bowl in the same manner as in the preceding method. The plaster powder is added more rapidly with no particular emphasis on sprinkling. The mixture must be stirred constantly while the powder is being added. It is ready to pour when the consistency of thick gravy is reached. Unlike method one, however, the second procedure requires that the plaster mixture be poured immediately. The frame for the mold must be made prior to the time the plaster is mixed to insure that no error in timing will result.

Clay may be used to form the frame in which to make the plaster cast. The frame may be made on a piece of cardboard or pasteboard. When the cast has thoroughly dried, both the clay and the pasteboard are easily removed.

The plaster case is now ready for painting. It is painted to show the arched rock strata, the oil and gas pockets, the water level being added if desired. It is advantageous, but not necessary, to paint the various rock strata following the proper geologic symbols.

The surface of the ground should be about half the height of the front of the display case so that enough prominence will be given to the underground formation. A good method for making the ground surface and the support for the plaster cast is to take one piece of cardboard long enough to make both surfaces, the ground and the front, and bend it in such a way that one part bends down to form the front and the other part bends back into the exhibit case to form the ground. A piece is then cut out of the part that forms the front which shows the underground rock structure; the hole thus formed is enough smaller than the cast to leave about $\frac{1}{2}$ inch of lap of the cast on all its sides. Good glue will hold the mold in place, but it will be held more securely if strips of paper and paste, or commercial sticky paper, are used to form a substantial cap over the back of the mold. Cut the strips long enough so that about $1\frac{1}{2}$ inches to 3 inches of them stick to the pasteboard on either side of the mold.

A derrick and pump are made to place above the mold base. These objects consist of pieces of balloon sticks and toothpicks. The balloon sticks are used to form the vertical supports of the derrick and the toothpicks are used to make the braces and the crossbeams. A square piece of cardboard is cut out that is larger than the base of the derrick, and the rig is built upon the base so formed. Quick drying cement is used to make all the necessary connections.

A small pump, cut out from a piece of folded drawing paper and painted orange shows up realistically on the floor of the rig. A piece of toothpick, painted black and extending from the head of the walking beam to the floor provides a sucker rod.

The tank battery and refinery are also constructed from paper strips on a base of cardboard. The tanks are made with paper and paste by cutting

strips of paper in widths that correspond to the height of the tanks. A pencil, which is greased with vaseline or grease, is used to shape the tanks. The strips of paper and paste are wrapped around the pencil and allowed to dry. Enough thicknesses of paper are added on the outside to produce tanks of a desirable size. When dry, the paper tanks are easily slipped off of the greased pencil.

Small copper wire is then used to make pipe lines from well to tank battery and from tank battery to the refinery. The copper wire is also used as pipe for the refinery. If the wire is wrapped around the paper tanks of the refinery, stuck into the open tops, and the ends stuck into punctures in the sides of the tanks a reasonable appearance of a refinery is produced.

Painting requires that colors contrast to show, but not enough to form a harsh appearance. The underground formations can be painted according to the color of the rock type being presented. The mold should be painted before it is attached to the Diorama frame. The derrick will be painted black. The tanks of the battery and the refinery are of silver color. A background is also suitably painted on the large sheet of drawing paper. The background should show a perspective of an oil field. No part of the project should be left uncolored. The outside of the frame should be painted to provide a pleasing appearance. Light brown is a natural color for the entire outside of the Diorama.

The derrick is glued to the floor of the Diorama directly above the middle of the plaster cast. The tank battery and the refinery are in the background of the well slightly to the right or left side so that they are visible from the front. The background is glued to the frame so that it covers both sides and the back of the display. None of the frame should be

exposed on the inside. Using iron glue--not quick-drying cement--cover the surface of the ground and sprinkle on sand to provide a realistic touch.

Class Use

Facts to be learned by the construction of a Diorama may be grouped under two headings:

I. Underground facts:

- A. Oil pools are generally located in an anticlinal formation.
- B. Oil floats on water, and gas pockets form above the oil-- an important relationship in natural oil and gas separation.
- C. The liquids and the gases are sealed between two layers of impervious rock.
- D. Oil is usually found in sedimentary rocks.

II. Surface facts:

- A. Crude petroleum is pumped from the ground or allowed to flow naturally.
- B. Crude oil is of little use in the state in which it leaves the ground, but must go through numerous refining processes before it is used by the public or industrial consumer.
- C. Salt water should not be allowed to enter fresh water lakes and streams or to flow freely over the ground.
- D. Numerous products other than gasoline and oil are produced from petroleum and its by-products.
- E. Oklahoma is one of the leading producers of oil in the United States and its production compares favorably with the production of many nations of the world.
- F. The United States is by far the leading nation of the world in production of crude petroleum.

G. Oil is transported in railroad tank cars, over the oceans in tankers, across the highways in tank trucks, and under the ground in pipe lines.

Conclusions

Learning is not all facts, for in addition to these concepts the over-all picture should include a discussion of the development of the oil industry with particular emphasis on Oklahoma, and the story of the work of nature in the making of crude oil.

This writer has mentioned only a few possibilities contained in a lesson accompanying the construction of a Diorama. The same general ideas of both factual and general learnings apply to any such exhibit pertaining to some interesting phase of geography.

The Diorama is an effective device in any grade where the pupils can understand the story being told. The story may be too advanced for some of the lower grades if particular effort is not made to choose some simple subject.

The time required for the construction varies according to the number of students participating in the work. If all parts of a Diorama are produced simultaneously, the entire structure can be assembled and painted in about six hours.

The opportunity for individual accomplishment and satisfaction in one's work is part of the over-all educational attainment that leads to initiative and self-confidence in each personality.

A

Paper Mache Relief
Map of Oklahoma

B

Paper Mache Fruits and Vegetables

C

Pine Cone Print
Open-Cut Stencil

D

Animal

E

Figurine

F

Globe

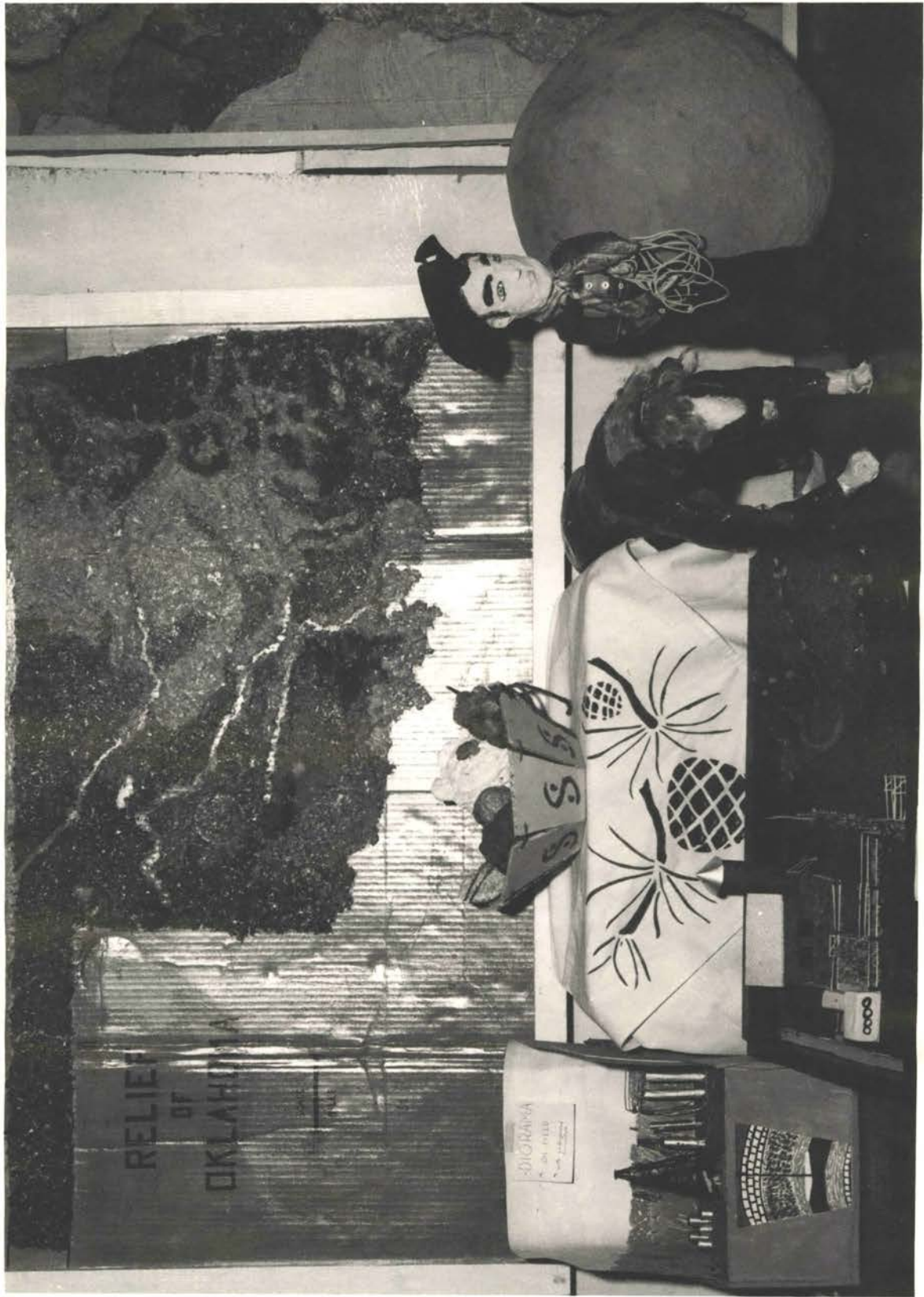
G

Diorama
Oil Field Scene

H

Panorama
Farm Scene

FIGURE III



CHAPTER IV

THE PREPARATION OF PANORAMAS

Panorama Construction Method

The Panorama, a model type exhibit, (Fig. III, H) organized as a lesson is widely used in the elementary grades and quite effectively used in middle and upper grades.¹

The Panorama differs from the Diorama principally in structure but also in its purpose. The purpose is not to focus interest on a central illustration, but to provide a small scale model of a comparatively large area so that the representation may be studied accurately and in detail. As was mentioned previously, both the Diorama and the Panorama may be used to supplement each other. A wider variety of subjects can be demonstrated with the Panorama because of its undelineated scope.

"Panoramas are not built in boxes or frames, but are laid out on a flat surface."² Any flat surfaced table, floor, or sand box will provide a suitable base, but if the model is to be moved about it is better to construct a portable foundation. Plywood, wallboard, or cellotex that is reinforced on the back and sides, will provide a strong portable base.

The Panorama is not built in perspective and can be viewed from any angle. Ordinarily it is constructed without a background. Attention must be given to the matter of relative proportions to avoid evident distortions. Mechanical devices can be used to a much greater extent and to greater advantage than in the Diorama. Attentive, ambitious pupils may wish to make

¹ See page 13 for a definition of the Panorama.

² Louis V. Newkirk, Integrated Handwork for Elementary Schools, p. 251.

a mill wheel that turns, gates that open, a windmill that runs, or water that flows. Models of communities, fairs, circuses, industrial plants, and farms usually are suitable subjects.

The writer selected a simple farm scene, such as would be common to the agricultural states, including Oklahoma, as a subject for a Panorama.³

The general objective is to study a farm's topographic setting, appurtenances, land use and development. Other more pointed objectives that would fall in line as a part of geography are:

1. The health and economic condition of rural peoples.
2. The contribution of agriculture to the national economy.
3. The rural family.
4. Seasonal farm activity.
5. The relation of climate to farming.
6. Farming as a business.

Materials needed for construction are:

1. Newspaper.
2. Clay.
3. Cellotex
4. Toothpicks.
5. Cardboard.
6. Thin wire or thread.
7. Quick-drying cement.
8. Iron glue.
9. Two balloon sticks.
10. Artificial grass.

³ The writer prepared the Panorama shown in Fig. III, H.

11. Poster paints.

12. Small quantities of sand and gravel.

The first step in construction is to provide a suitable base, the size being determined by working conditions and amount of detail to be shown. Cellotex was used for the base of the Panorama in the illustration. It is durable, strong when reinforced, and easily penetrated by pins. Its rough surface texture is a desirable feature as it allows surface features to adhere readily when glued.

The completion of the frame is followed by the building up of the land features such as the drainage pattern and hills shown in the illustration. Wadded newspaper, clay, or plaster may be used to develop land features. If plaster is used it should be patching plaster. Such plaster should be mixed with a combination of water and vinegar rather than water alone, for this reduces the hardening speed, making possible sufficient time for carving and shaping.

The third part of the procedure is to cover the ground surface; if, as in the example, it is a scene containing large areas of grass, the whole surface is covered with material to simulate grass. When total surface coverage is applied, it also eliminates the need for cutting corners to fit about objects.

The grass may be green paper for small Panoramas, or artificial grass for larger productions. Artificial grass may be produced by covering the surface of a sheet of drawing paper with glue and sprinkling on any green glazing material.

With the base completed, the objects may be prepared. There is no essential order of making the articles other than that common sense suggests. The sequence the writer used in preparing the farm scene is explained below.

First, the house was constructed of clay, shaped by hand and glued to a piece of cardboard. The cardboard was large enough to provide a base for the house plus the porches. The toothpicks were then used to build the front porch rail, the posts consisting of small pieces of toothpicks cut from the thick ends, while the railing was made from the thinner remaining part of the toothpick.

Second, the barn was made of sturdy cardboard. All four sides of the barn are cut in one continuous strip the length of which is equivalent to the sum of the length of all four sides of the barn. The single strip is then glued with quick-drying cement where the ends meet. The silo is constructed in almost the same manner as the barn. Cardboard is difficult to bend into the round shape of the silo, hence, reality is sacrificed slightly and a six-sided or four-sided silo is constructed. This intentional variation in construction has no effect on the value of the Panorama. Roofs for both the barn and the silo are cut and bent into shape. Cardboard is easily adapted to the simple barn roof, but drawing paper which is much easier to work is equally effective when used for the top of the silo.

Third, the pond in the pasture was made. Clay was used as a dam along the drainage lines, but sand may be used instead, creating an equally suitable effect. If plaster should be used for the surface constructions underneath the grass, it may also be used here as it can be painted later. Such constructions will also add permanency to the model if desired. Be certain that the pond is in its proper position to capture runoff water from higher land.

Fourth, the fences, gates, loading dock, and feed trough were constructed. All the fencing along the roads was made of very thin wire, and posts were made of balloon sticks. Heavy white thread may be substituted for the wire.

Posts were glued to the ground, and the wires were glued to the posts.

All glueing was done with quick-drying cement. The gates were constructed of toothpicks and placed in position. When placing the gates in position be careful to see that they are located in a natural pattern to facilitate ordinary movement of animals and machines around the farm. The fence leading up to the house and the fencing around the barnyard were made from toothpicks. The loading dock also was made entirely of toothpicks and was left unattached on the bottom so that it could be moved about. The feed trough was constructed of a single piece of cardboard bent into a square bottomed, U-shaped trough with the ends cut to fit and glued into place. Legs may or may not be added.

Fifth, when the fences were established and the roads were located the next step was to prepare three types of road surfaces. Along the front of the house ran the concrete highway. This was shown by using grey cardboard cut into strips to fit the width of the road. If a driveway is to be constructed, cardboard is again the material which is used to represent a concrete surface. The gravel road was simulated by applying a thin sheet of glue over the surface of the road bed and sprinkling on very fine gravel. The sandy barnyard was shown by glueing sand to the barnyard surface.

Sixth, animals were shown by simple cardboard cut-outs with a cardboard prop behind them for support. Another way is to use cut-outs made from folded drawing paper which will have four legs and stand alone. Animals are difficult to put on small Panoramas as their appropriate sizes are difficult to reproduce when compared to houses and barns which are only a few inches high. Vegetables are effectively painted on small garden plot scenes. Trees show most clearly when real twigs or any other objects that produce diminutive trees are used and placed in such a manner as to extend above the land surface.

Some sponge on the end of a piece of toothpick or match stick provides a relatively life-like tree. On large Panoramas real materials usually are preferable when they are obtainable.

The final step in completing a Panorama is its painting. Everything should have harmonizing color to help hold the interest of observers. White houses, red barns and silos with silver or colored roofs are appropriate. Windows and doors are added with black paint. Gates and wooden fences are shellaced if a natural wood color is desired or they can be painted white. Any exposed part of the frame itself is painted green to bind the whole scene together. A fully painted exhibit should leave nothing to distract the observer, the whole construction forming an entity.

Class Use

The facts and principles that accompany the learning associated with the Panorama construction and interpretation are numerous. Some of these could be fitted into the general outline that follows.

Unit title: The Farm

- I. Economic phase
 - A. Average income.
 - B. The farm's contribution to the retail price of goods.
 - C. The agricultural products grown commercially.
 - D. Plants and animals raised for home use.
 - E. Production as compared to other areas of the United States and the world.
 - F. The size of the investment in capital, equipment, home, and animals.

II. Social and Cultural phase

- A. Usual forms of entertainment.
- B. The rural children's play as compared to that of urban children.
- C. The facilities of the average farm home, such as electrical and natural gas facilities.
- D. The rural and urban educational facilities compared.
- E. The rural family group compared to the urban family group.
- F. The size of farm families and its significance.
- G. Rural and urban child delinquency rates compared.

Numerous generalizations may be added as to why rural and urban life differ or do not differ.

Conclusions

To this list may be added ideas developed by comparisons, study of color contrasts, recognition of the value of cooperative effort in presenting a subject, fostering of joy and friendship in working together, and enhancing the pleasure in getting something done. School can be made a place where children want to be and not where they have to go.

Pertinent skills that may be acquired are in the handling of tools, in learning to paint effectively, in learning to mix and mold plaster correctly, and in gaining more dexterity with the hands.

There is practically no limit to the subjects presentable in a Panorama and no end to the educational values that may be gained. The depth of the subject determines both the grade level for which it is suited and the amount of time and skill required for device construction. The Panorama illustrated here required about eight hours to build, while larger more

difficult exhibits would require more time. The project should not be too complicated.

The Panorama broadens the scope of study as compared to the Diorama. The center of attention is not on a particular focal point, but rather attention is diffused so that a general interpretation of the related portions of the Panorama may be studied as to their effect on each other and their importance to the whole unit.

The Panorama is a study of the planning, coherence, and interdependence of the many parts of our surroundings.

CHAPTER V

THE PREPARATION OF PAPER MACHE FIGURINES

Figurine Construction Method

The preparation of mache figurines is developed around a tentative study outline for a unit plan to aid in the study of the geography of Oklahoma. The objectives to be kept in mind when making figurines and animals are:

- I. To prepare figurines and animals related to Oklahoma's geography.
- II. To gain an impression as to the different areas of habitation and different groups of the state's people.
- III. To learn something of the past history of Oklahoma answering the questions
 - A. Why does Oklahoma have particular groups of people living within her borders? Why are there so many Indians and so few residents of foreign birth by comparison with other states?
 - B. Why do Oklahoma's farmers raise cattle, wheat, and cotton as principal items rather than tobacco and citrus fruits?
- IV. To learn to know the names and recognize the economic value of animals, domestic and wild, that live in Oklahoma;
 - A. To learn the eating and breeding habits of animals.
 1. To aid in developing and raising healthier and better animals.
 2. To aid in the preservation of Oklahoma's wildlife.
 - B. To learn something about the protection of natural and cultivated pastures, to protect present pastures and to add more usable pastures for the future.

The materials for preparation are easily obtained and are inexpensive.

Those needed for this project are:

1. Newspaper.
2. Paper towels.
3. Wallpaper paste.
4. String.
5. Pasteboard.
6. Paint.
7. Odd bits of material for costumes.

Other materials may be used for special purposes such as feathers in an Indian headdress or thread and crochet cotton for hair.

The technique for the preparation of figurines is easily explained in progressive steps with the aid of the diagrammatic drawings given in Figure IV on page 36 and Figure V on page 39.

The procedure to be used is as follows:

Step One (Fig. IV, A): Three open sheets of full-sized newspaper, or smaller, if less than an eighteen-inch figure is desired, are layed on a flat surface. These sheets are folded one at a time and rolled to form three separate rolls of paper. The rolls are made by forming a ten-inch roll at the left side of the paper and refolding the ten-inch fold until it cannot be folded any further. It is now very compact. The remainder of the sheet is then rolled onto the folded base. The finished rolls of paper are tied in two places to prevent loosening.

Step Two (Fig. IV, B): The first actual step in making the body is to bend one of the rolls in the middle with the rounded elbow at the top, the sides equal in length and tied together. The upper half of this roll eventually becomes the head and neck.

Step Three (Fig. IV, C): The two remaining rolls of paper are added and will later become the arms, body frame, and legs. One strip is tied to each side of the bended roll, prepared in step two, and securely tied in at least two places. Enough of the original bended roll must remain above the upper tie to allow for the head and neck. The upper ends of the two added rolls are now bent down to form the skeleton of the arms. Leave room to work on the head.

Step Four (Fig. IV, D): The adding of shape to the head is the next step. A fourth of a full sheet of paper is held in the hand and kneaded in the same manner as bread dough. The kneading is started at one corner and all the paper is kneaded underneath an area of surface the size of the figure's head. The top surface should be smooth and the bottom side wrinkled and folded.

Step Five (Fig. IV, E): The paper wad is added to the front of the figurine's head-skeleton. At the top of the head roll, extending above the elbow and leaving room for the neck, the paper wad is pasted to the skeleton and tied into place with the smooth surface out. It is necessary to use paste between the folds in the back of the wad so that the head will remain in the shape to which it is molded. The face may be given a little shape by tying the string in a position below the anticipated cheek bone level where a face is generally drawn. The kneading procedure is repeated and the second wad of paper is pasted and tied to the back of the head.

Step Six (Fig. IV, F): The body is made with the same procedure as the head. A half sheet of paper, or more, is used depending on the size of the body required. The paper is then kneaded into a more elongated shape and pasted and tied to that portion of the remaining skeleton that is to become the body. One wad of paper is pasted and tied to the front and one to the

back of the skeleton. An additional tie at the waistline may be beneficial to the body shape.

Step Seven (Fig. V,G): To form the shoulders, a small piece of paper, determined by the effect desired--whether you are preparing a football player or a thin man--is kneaded, pasted, and tied in place at the top ends of the rolls that were earlier designated as the arms.

Step Eight (Fig. V, H): The body is given form and wrapped with paper strips. The paste and paper is still wet, as all the preceding steps were continuous, so with the use of finger pressure, the desirable form and shape may be given to the body. The entire figure is then wrapped in paper strips not over one inch wide. Wrapping gives a more even surface to the body of the figure and also aids in retaining the desirable body and head shape. Paper towel strips are preferable because they are stronger.

Step Nine (Fig. V, I): The head surface is smoothed by the use of a piece of paper towel. Cut a square of toweling big enough to cover the head and wet it with paste. Using the procedure shown in the illustration, pull the towel smoothly and firmly across the face side of the head and draw the edges of the paper square to the back of the head. An additional small piece of paper may be placed over the folds on the back of the head. The doll is now set aside to dry.

Special positions of stature may be obtained by tying the limbs with string in any desirable position. If the arms are to be folded across the chest of the finished figurine, bend them now while the figure is still wet and tie them in place. When the doll has dried and strings are removed the arms will remain in the position in which they dried. When adding these final touches to the wet figure be sure to bend forward the bottom of the paper rolls that are the legs to form a base for making the feet.

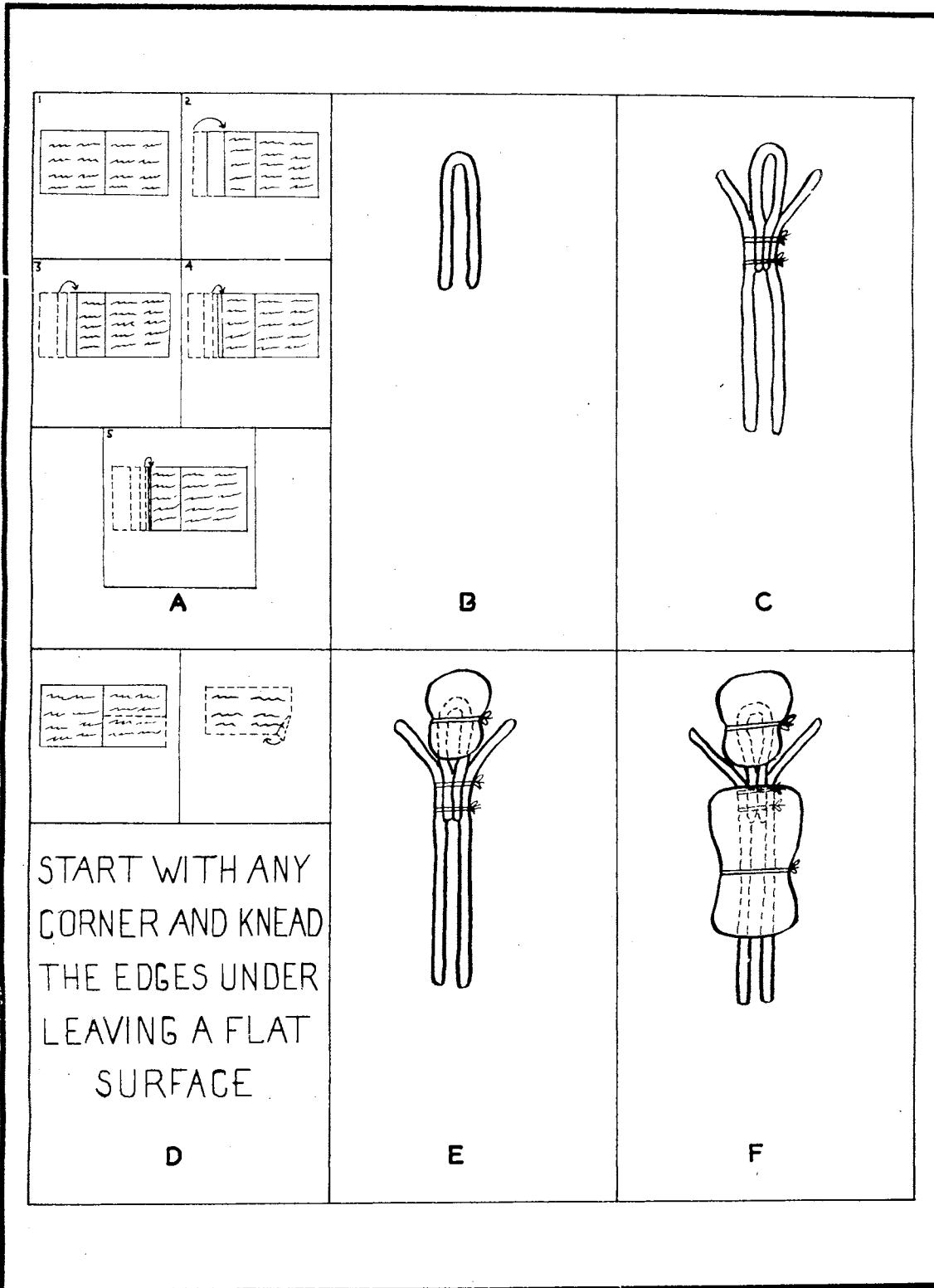


FIGURE IV

Step Ten (Fig. V, J): If you are making a standing doll, support must be added to the feet. When the doll has been completed, except for the legs and feet, the support may be given, either before or after it has been allowed to dry. Preferably support is added before the doll dries. Pieces of pasteboard, the width and length of the legs from body to heel are pasted and tied to the back of the legs. These ties must be secure so there will be no buckling at the knees. Paper strips are wound around the leg and pasteboard pieces. Pieces of pasteboard cut in an oval shape about two inches wide are now shaped. They should be long enough to support the figure in a standing position, thus the length depends on the size and weight of the doll.

Step Eleven (Fig. V, K): Added support is now given to the heel section of the foot so that the doll will stand upright. Paper strips which are about four layers thick are pasted over the foot as shown. Paper strips are also added to the angle of the heel and the oval base. Extra heavy figures may require the use of wire under the heel support to provide extra strength. The doll must be allowed to dry. Be sure to support the doll for this second drying in such a manner that it will be standing upright. Remember that the figure will dry and retain any character features acquired when wet.

Step Twelve (Fig. V, L): The last step is the giving of life and meaning to the figurine. This all important step includes painting the doll and making a suitable costume. The basic step in painting is to cover the body with flesh colored paint. Only exposed portions need be painted, but in the event that future use of the figure with a different costume is anticipated, the whole body should be painted. Facial features are painted on when the flesh coat is dry. Poster paints may be used effectively as

they dry rapidly.

The costumes are prepared in the colors and designs necessary to complete the thought being presented by the figurine. Presentation of the truth in costume representation may make the difference between success and failure in presenting a geography lesson developed around the preparation of this device.

Animals

The preparation of paper mache animals is quite similar to the making of figurines. The principal difference between the two procedures is in the making of the skeleton forms from the rolled paper sheets. The method of building up the head and body form is the same as previously described.

The most general skeleton form used, the basic form for most four-legged animals, such as the cow, horse, or mule, is shown in Figure VI, A. Three rolls of paper are used; they are tied and pasted in position as illustrated.

The elephant varies from the standard example in Figure VI, A, by needing a longer extension of the paper roll in front of the figure which is to be made into a trunk. (Fig. VI, B) His tail is lengthened with another more narrow, short roll of paper. The elephant requires three rolls of paper used as illustrated.

The giraffe presents an interesting variation in body structure. The long neck and head must be provided from the paper roll used for the body. Added tail length must also be provided for the giraffe. The correct form of the skeleton should provide for back legs shorter than the front legs. The surplus of about one inch of paper roll on the back legs is bent forward to make the back feet. A pair of feet must be made for the front legs. The

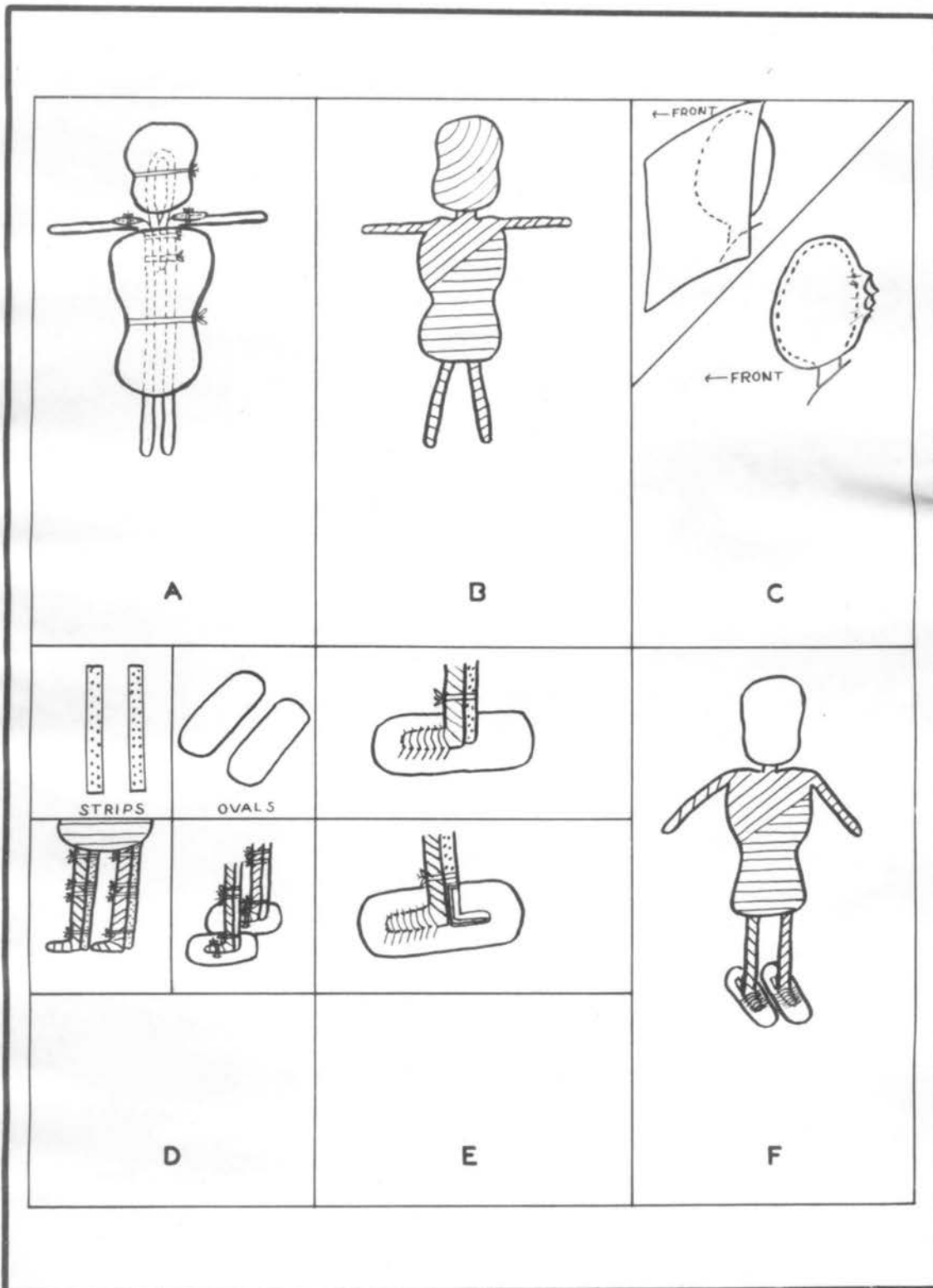


FIGURE V

leg length must be carefully determined to present the giraffe in his usual posture (Fig. VI, C). The giraffe requires three rolls of paper, one roll for the neck and back, and one roll each for the front and back legs. Part of a fourth, more narrow roll is added to the tail.

The preparation of fowls varies from the ordinary pattern and uses only two full-sized rolls of paper. Two small parts of another roll are used to make the feet. The fowl skeleton (Fig. VI, V) has a tail that turns up. The feet are produced by folding the smaller rolls into a V shape, then tying and pasting them to the lower bended end of the leg.

The rabbit and squirrel are made from a similar type of skeleton (Fig. VI, E). The greatest variation in this group of animals will be in the length of the tail. Frogs and kangaroos are also members of this skeletal group. Preparation of these and like-formed animals requires the use of two rolls of paper of full length and another roll of about one-third length. One full roll is used for the head, body, and tail; another full roll is used for the hind legs; and the third of a roll is used for the forelegs.

The last animal form to be discussed is the dog. The preparation of dogs, an animal common to everyone, shows that familiar animals can be constructed in a manner representing some of their habits and uses. The hunting dog skeleton (Fig. VI, F) is a good example. Three full-length rolls of paper are required for the body and legs. One roll becomes the frame for the head and tail, and the two other rolls form the legs, and help to form the body. Five strips of paper about three inches wide and eight long are pasted together and used for ears.

All animal skeletons presented here must be padded with kneaded paper wads to form the desired shapes. They are painted in natural colors, if

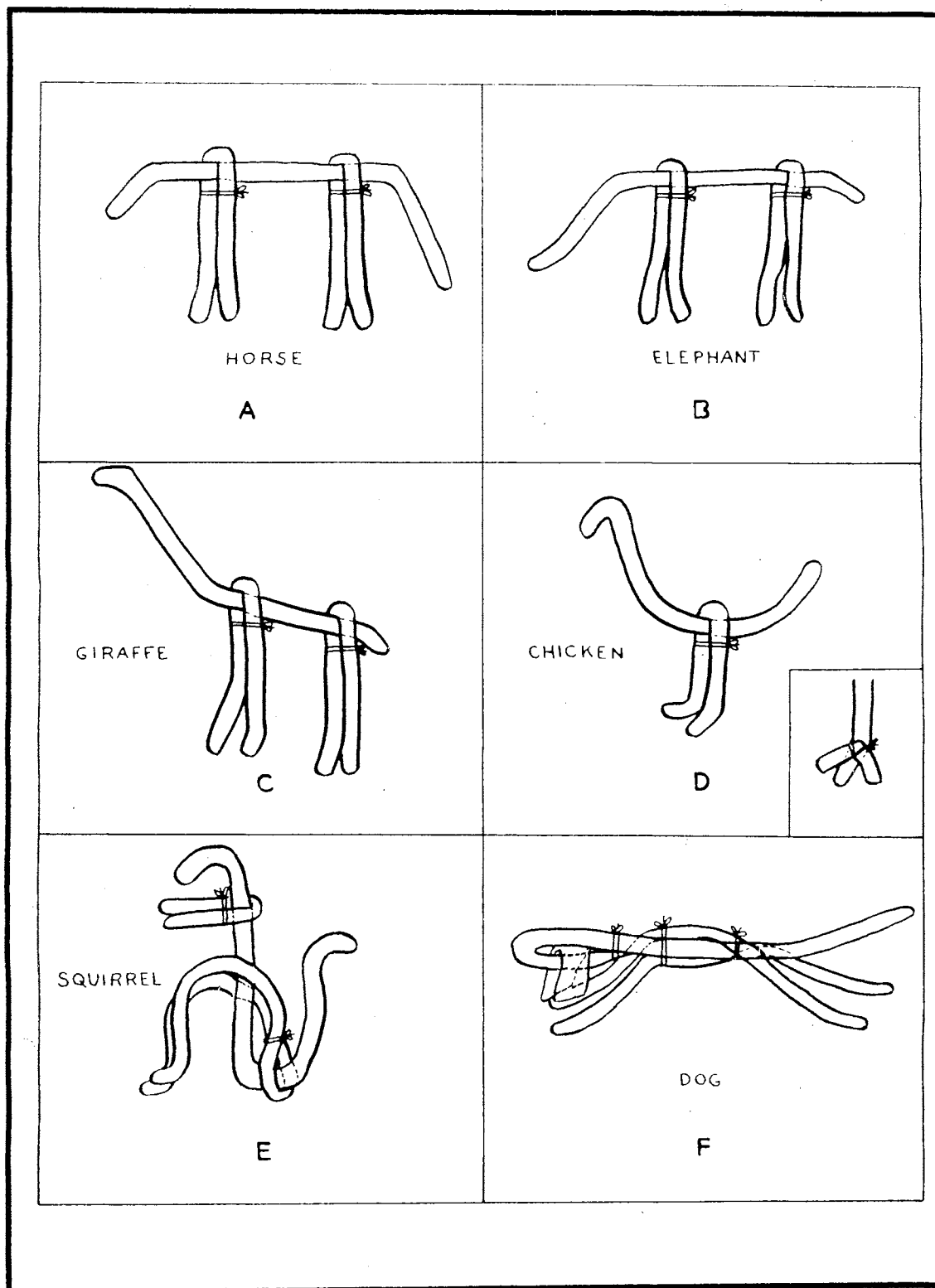


FIGURE VI

the full value of the lesson is to be realized.

Class Use

Learning that can accompany the preparation of figurines and animals is practically inexhaustible. Knowledge is spread over nearly every field including geography, history, sociology, agriculture, and physiology. A few questions that might accompany a lesson on an Oklahoma unit are:

I. Indians.

- A. What Indians originally lived here?
- B. What Indian tribes came to Oklahoma and from where?
- C. When, why, and how did the Indians come to Oklahoma from other territories?
- D. Where did the Indians originally live in Oklahoma, and where do they live now?

II. White settlers.

- A. Who were they, and from where did they come?
- B. Why did they come and how did they get here?
- C. Where did they settle and how did they acquire land?
- D. What kind of life did they lead?

III. Dress

- A. Indian dress.
 1. Regular dress.
 2. Ceremonial dress.
- B. Dress of settlers and farmers.
- C. Dress of ranchers.
- D. Dress of special religious groups.

IV. Animals.

- A. Distinguish between the various types of milk cows.
- B. Distinguish between the various types of beef animals.
- C. Discuss the varieties and habits of Oklahoma's birds of field and of Oklahoma's migratory birds.
- D. Discuss the varieties of predatory animals, and of fur bearing animals in Oklahoma's fields and streams.
- E. What is the economic importance to the state of any and all the varieties of animal life, and the various groups of people?

Conclusion

The use of figurine and animal preparation is effective at any grade level if the teacher develops the attitude that preparing paper characters is not exclusively for children. Children under high school age generally show a more genuine interest, while older ones may become enthusiastic after the project is undertaken.

The time consumed in preparation of figurines and animals always varies according to the type of animal or character being presented and how elaborate a costume is being prepared. Eight to twelve hours of actual work will generally be sufficient. Time may be reduced a little by having two students work together. They can help each other particularly on occasions when two hands just do not appear to be enough. The actual working time must be distributed over a period of four or five days to allow for satisfactory drying. The hours of paper mache work need not be wasted as far as actual classroom lessons are concerned; a great deal of knowledge can be gained at the same time if the teacher will see that the class always has an interesting topic of discussion. Open-minded opinions

and free expressions will add much to these stimulated discussions.

A lesson based on figurines and animals may be developed for any portion of a country or of the world.

CHAPTER VI

THE PREPARATION OF MACHE FRUITS AND VEGETABLES

Fruit and Vegetable Construction Method

Preparation of mache fruits and vegetables (Fig. III, B) is the most rapid of the paper mache projects and yet it includes much useful information. There are two main objectives to such a lesson when it pertains to Oklahoma or to any particular region.

- I. The preparation of mache fruits and vegetables.
- II. A knowledge of the varieties of fruits and vegetables common to Oklahoma.
 - A. Edible, commercially marketed fruits and vegetables.
 - B. Edible, non-marketed fruits and vegetables.
 - C. Non-edible fruits and vegetables.
 1. Poisonous.
 2. Non-poisonous.

The materials required for preparation are:

1. Paste.
2. Paper.
3. Paint.
4. Toothpicks.
5. Paper strips.

The paper usually found most satisfactory for mache pulp is the shredded paper used for packing fruits and vegetables for shipment, and is generally available at any local grocery store.

The technique for mache fruit preparation is quite simple. The paper strips are first soaked with water to make a wet pulp. Overnight soaking

is preferred. Then the moisture is thoroughly squeezed out. Paste is added until the pulp is well saturated. A handful of pulp is taken from the bowl and squeezed in the hands to remove the excess paste. Finger and hand pressure are used to mold the handful of pulp into the desired shape. Toothpicks or natural stems may be used for the stems. The preparations are then set aside to dry. Drying takes a few days even during good drying weather and as much as a week during damp, rainy periods.

The actual time required for preparation takes less than two or three hours, not counting the overnight time required for soaking the paper, and the period for drying the fruit. As little as thirty minutes may be ample for simple preparations such as apples or cherries. It is a common occurrence for the mixing and applying of the paint to take longer than the molding of the fruits or vegetables.

The mold must be allowed to dry thoroughly. They are painted in tones that as nearly as possible approach the natural color of the fruit.

Class Use

Facts that may be learned in relation to this unit are:

1. Oklahoma fruits and vegetables that are of economic importance.
2. Other edible fruits and vegetables common to Oklahoma.
3. Names and identifying characteristics of non-edible fruits and vegetables that grow in Oklahoma.
4. Oklahoma not only produces wheat, cotton and petroleum, but also fruits and vegetables.

Conclusions:

The preparation of mache fruits and vegetables is effective at any school level above the first or second grade. Such pupils are still

unaccustomed to factual instruction and may mix the information with undesirable results when they try to apply in the field what they have learned in the classroom.

CHAPTER VII

THE PREPARATION OF MACHE WALL MAPS

Map Construction Method

A paper mache wall map, made from paper strips soaked in paste and molded on a suitable base to form a relief map of Oklahoma, is a fitting teaching device as well as a decoration for any classroom. Preparation of a mache map of Oklahoma (Fig. III, A) involves two principal objectives:

1. Preparation of a suitable relief map of Oklahoma.
2. The acquisition of general knowledge of the state's features.

The materials for construction are:

1. Paste.
2. Paint.
3. Relief map of Oklahoma.
4. A piece of pasteboard larger than the size of the map to be produced.
5. Paper for mache.

Again the shredded packing material used for packing fruits and vegetables for shipment is satisfactory. If shredded paper is not available from the local stores, it may be cut from newspapers with scissors. The strips should not be over one-quarter inch wide.

The technique of construction of an inexpensive wall map of Oklahoma is described by Myrtle C. Schwarz¹ as follows:

"On corrugated cardboard taken from a paper carton, state boundaries, physical features, and streams are outlined. Upon this background is laid the paper mache, and from paper strips, being held in place by

¹ Myrtle C. Schwarz, Art Consultant of Teacher Education at Oklahoma A. & M. College, Stillwater.

paper hanger's paste. Ordinary poster paint is applied after the surface becomes dry, following the color scheme of the reference map. A scale of miles, directional arrow, title and other lettering are added in India Ink. Finished, wooden strips are tacked around the edge as a frame, and wire is attached to them for hanging."

Thus at low cost, a permanent wall map with sharp relief features in bright hues is produced, suitable for classroom instruction and as a wall decoration.²

The process begins with drawing the boundary and the principal water features of Oklahoma on a piece of pasteboard. The paper mache and paste are now spread in an even, thin layer over the entire surface of the map, leaving the lakes and streams exposed. The plains of Oklahoma gradually rise from east to west and this is shown by the gradual increase in the thickness of the mache.

On the gentle sloping plain the more prominent features are built up individually. Some examples of the prominent features that should appear on a relief map of Oklahoma are the Wichita Mountains, Ouachita Mountains, Osage Hills, and the Cooksen Hills.

Attention should be given to the comparative altitudes of the features and the amount of area which they cover. Accuracy in producing comparative elevations is acquired by making a scale which is suitable for the size of map being made; for example, if one-third of an inch equals 1,000 feet, comparative altitudes could be easily shown.

The map must be allowed to dry after the mache work is completed. The length of the drying period varies with general weather conditions. Pasteboard will warp when drying if care is not taken to weight it down on a flat surface. The weight required depends on the thickness of the pasteboard.

² David C. Winslow, "Inexpensive Wall Map of Oklahoma Constructed." Oklahoma Teacher, December, 1948, p. 33.

The drying process is followed by painting the surface. Poster paints are used to cover the surface of the mache and the immediate background of the map. The pasteboard on which the paper mache is placed may be cut down, but be sure to leave sufficient borders for framing. The generally accepted color to be used in representing elevated features is brown. Very light brown represents plains and dark brown represents mountains. Grey is used to denote areas below sea level. Orange paint mixed with brown provides the desired effect for producing intermediate shades between light and dark brown. Lakes and rivers should be painted some prominent blue that can be readily seen throughout the room. Shellacing or varnishing the map and frame after the paint has dried gives added permanency. Each map must have a title, scale of miles, a legend, and a directional arrow, otherwise the map is geographically incomplete.

The time required for construction of mache maps of this sort varies according to the size of the map being prepared and the type of area being represented. About ten hours of actual working time is required for the production of a relief map of Oklahoma. Study plans developed around mache maps are applicable in the fourth grade level and above.

A continent, such as South America (Fig. I, A), constructed using this method results in a very fine physical and political map of a continent. The physical features in the illustration have a secondary place; the political features, the primary place. Hence, the relief features have no special color scheme. Each political unit is colored a different bright, contrasting color. A color may be used twice if the political frontiers do not touch. Map lines can be made still more outstanding by using bold, black lines for boundaries between nations.

Class Use

A series of such projects as the above paper mache maps will provide the classroom with a variety of serviceable, easily interpreted maps.

Numerous facts may be learned from such a project as the construction and the interpretation of the Oklahoma paper mache map.

- I. The names and locations of various features of the topography of Oklahoma.
 - A. Principal lakes.
 - B. Prominent streams.
 - C. Outstanding elevations.
 - D. Relation of one natural feature to another.
 - E. Shape of the state.
- II. Location of special features of cultural importance that are directly related to geography.
 - A. Location of water power projects and their importance to the state.
 - B. Location of national and state parks, and the names and purposes of these parks.
 - C. The effect of the physical features on the population distribution, and the distribution of industry.
- III. A very important lesson to gain for future use is the understanding as to how to read other relief maps by the color scheme. An indirect benefit comes from the development of ability to read other types of maps such as those which use color intensity to denote population density, annual precipitation, and vegetation distribution.

Students should gain the concept that Oklahoma is not a "plains state"

in an absolute sense, but actually contains large areas of hilly and even mountainous country. Also the idea that physical features play an important role in the settlement pattern, and the general economy of the state comes into consideration.

The information associated with the preparation of a mache relief map of Oklahoma is multiplied when the procedure is applied to a larger land unit such as a country or a continent.

Conclusions

True value lies in the visual aid to geographic learning provided by paper mache maps. Pupils will remember what they make and what they see more readily than they will retain what they hear. Relief characteristics of an area are features protruding above the general plane of the landscape and when actually observed as such on a mache map the resultant learning is more entrenched in the minds of the pupils. Observation techniques have stronger powers of teaching than the practices of reading and listening.

CHAPTER VIII

THE PREPARATION OF OPEN AND CLOSED STENCILS

Open and Closed Stencil Construction Method

The paper and cloth prints made from hand-cut stencils (Fig. II, F, and VI, A) serve a very useful purpose in geographic teaching. "Stenciling means marking a pattern on a plain surface through a design cut in a thin piece of paper, cardboard, or metal."¹ The study of nature in the elementary school followed by physical and biological science courses in the junior high and high school open opportunities for use of the hand-cut stencil. It is best to specify the term hand-cut stencils because the value and interest of a lesson is enhanced when the pupil must depend on his own skills for the preparation of true representations.

The objectives will vary with the lesson to be learned, but some of the general objectives are:

1. Proper use of the stencil cutting tools.
2. Preparation of representative cuts of the subject.
3. Knowledge of how prints are made both by hand and by machine.
4. Added learnings concerning the subject.

Stencils of all types readily fall into two distinct classes which for our purposes can be called an open type stencil with solid print figures, and a closed type stencil with outline prints. The open type is represented in the corn print (Fig. VII, A). The closed type is represented by the mimeograph stencil sheets, examples of which are found in any school office, and are often times the method used in the publication of small school

¹ E. M. De Foubert, Every Girls Book of Hobbies, p. 218.

A

Corn Print
Open-cut Stencil

B

Figurine

C

Figurine

D

Animal

E

Animal

F

Paper Mache Fruits and
Vegetables

FIGURE VII



newspapers. The open stencil is hand cut and printed. Special tools are needed for cutting the closed stencil, and prints are made mechanically. The closed stencil has an advantage of speed and accuracy of reproduction and the variety of line illustrations such as maps and pictures that can be produced. Stencils that are to reproduce solid colored objects should be open cut, each change of color requiring a different piece of stencil. In reproduction, care must be taken to allow each color to dry before the next stencil is applied.

The materials used for cutting stencils are few, such as:

I. Open stencils.

- A. Waxed, comparatively heavy paper or cardboard for a stencil to be used with paints.
 1. Ready waxed rolls of shelf paper.
 2. Drawing paper dipped in paraffin.
 3. The stiff, waxy, cushion sheet in back of a mimeograph stencil, an item which is discarded in most offices.
- B. Unwaxed drawing paper or cardboard can be used for stencils to be printed with crayon.
- C. Tools.
 1. Single-edge razor blade or a stencil knife.
 2. Scissors.
 3. A hard, flat surface on which to cut.

II. Closed stencils.

- A. Mimeograph stencil sheets.
- B. Tools.
 1. Typewriter.
 2. Stylus, the tool for writing and drawing.

3. Correction fluid.
4. A hard, sturdy surface on which to use the stylus.

The material from which the open stencil is to be cut should be laid on a smooth, hard cutting surface such as hard wood or glass. The outline of the design is traced on the surface of the uncut stencil material with the aid of a sheet of carbon paper and a sharp pencil. The stencil plate, with the outline drawn on its surface, is secured to the cutting surface. Tape is usually preferred, as thumb tacks will soon ruin the surface of the cutting table. A single-edge razor blade or a stencil cutting knife is employed to cut out figures. The cutting edge must be pressed firmly enough so as to require only one stroke for an effective cut, and the work must be slow and careful enough to avoid slips. One bad slip could produce a jagged uneven line and spoil the whole stencil. A light tap with a pencil after the cutting is completed will cause the severed parts to fall out.

The closed mimeograph type of stencil is produced with the aid of a typewriter and a stylus, either of which can be used separately but are usually used together. The printing is done with the typewriter, and the drawings are done with the stylus. The stylus is used in a manner similar to a pencil; the principal difference is that added pressure is used with the stylus.

A distinct advantage of the closed stencil is that it may be corrected. The correcting procedure is as follows:²

1. Raise the stencil sheet from the writing plate for cushion.

² A. B. Dick Company, "Instructions for Using A. B. Dick Mimeograph Stencil Sheets."

2. Apply a thin but complete coat of correction fluid over the error and let it dry.
3. Relay the stencil on the writing plate or cushion and write or draw in the correction, using a light stenciling pressure.

The materials for printing the stencils vary, both in expense and technique.

The materials needed for printing are as follows:

- I. Open stencils.
 - A. Surface on which to print the design.
 - B. Stenciling brush.
 - C. Coloring agent, either paints or crayons.
- II. Closed stencil.
 - A. Mimeograph paper on which to print the stencil.
 - B. Mimeograph duplicator, either hand-operated or automatic.
 - C. Screen plates, if shading is to be used to add force to the illustration.

The material on which the open stencil is to be printed should be pressed flat. If the material contains any foreign agent, such as found in flour and feed sacks, it should be washed well. Otherwise the stencil print will partially fade out with the first washing. Paper to be stenciled requires no special preparation.

Unwaxed surfaces on paper, and cloth, have a tendency to allow the water or oil base of the paints to spread out and exceed the bounds of the stencil. Much of the unwanted spreading can be avoided by these two ways: (1) dab the paint that you intend to use on a blotter or a piece of cloth and allow it to set for a moment and let the extra moisture be absorbed before the paint is used, or (2) put a blotter underneath the material being pointed to absorb the excess moisture as the paint is applied.

A stencil brush, round flat-tipped, stiff bristled, and a suitable handle should be used for open stencil printing. "Stippling" is used to make the design; it is done by the use of short, hard strokes. The strokes are made from the outer edge of the stencil inward toward the center. Caution: Never stroke from the center to the outside when printing the edge of a stencil. A variety of colors may be used on a stencil print if care is taken to use individual cutouts for each color. Do not use a painting or a scrubbing motion, as either is liable to move the edges of the stencil and result in a blurred outline. If the design is to be repeated in a line or series, care must be taken to avoid inconsistencies in spacing, or a clumsy joint.

Open stencil printing with crayons eliminates the fear of blotting and spreading. The same stencils may be used with crayon as were used with paints, but crayon stencils, if cut from unwaxed paper or cardboard cannot be used satisfactorily with paint. Crayons should be well sharpened at all times. Different shades of the same color are produced by variation in the pressure on the crayon. The crayon is used with a stroking motion to produce unstreaked prints, all of which are in the same direction and applied with equal pressure. Deep tones may require a number of layers of color, each additional layer to be added with strokes at right angles to the strokes of the layer underneath.

Crayon and textile paints, if used as the coloring agents, can be set quickly by pressing with a hot iron. Caution: Do not press the colored surface by contacting it with the hot iron, but first cover it with a few layers of damp paper or a damp cloth. If properly set, the finished product can be washed without losing its color in warm water using mild soap flakes. Paper prints colored with any type of agent may be shellaced and dusted to

be kept clean, but should not be washed.

A print, such as the corn design, requires numerous shadings and stencil cutouts. When printing a multiple type stencil, too much care cannot be taken when mixing the proper tones of color, and when making the contacts between prints. One clumsy joint or one undesirable shade may make the difference between a mediocre print and a bold, attractive design.

The printing of the closed type stencil is mechanical and there is little need for skill and technique other than the ability to run the duplicating machine. The prepared stencil is hooked around the cylinder of the duplicator and adjusted till it adheres smoothly. The paper is automatically fed into the machine, printed, counted, and stacked in a neat pile ready for use. The electrical duplicator produces over one-hundred copies per minute. Manual operation produces fewer copies.

It is well to remember that for self-expression and enjoyment the open stencil is more suitable. On the other hand if speed of reproduction and consistency are more important considerations, it is better to use the closed type, or mechanical stencil.

Class Use

A simple lesson plan to accompany the stencil cutting techniques is organized so as to bring about cooperation and initiative on the part of the members of the class.

A typical lesson may be illustrated:

- I. Subject--Identification of trees through leaf characteristics.
- II. Materials.
 - A. Two or three leaves picked by each individual from trees that

he can positively identify.

- B. Waxed, stiff paper from which to cut stencils.
- C. Drawing paper on which to print the stencils.
- D. Paints and stencil brushes or crayons for printing the stencils.

III. Procedure.

- A. Each student draws an outline of the leaves he brings to class on a stencil sheet and cuts out the figure. The open stencil is then printed on drawing paper.
- B. Under each different print the student prints the name of the tree, the economic value of the tree, and his own name.

IV. Supplementary material.

A mimeographed paragraph about each different type of tree represented, including its distribution, may be prepared to hand out to the class.

The students gather the descriptive material, prepare, and print the stencil.

Similar studies using maps, animals, birds, fishes, flowers, fruit, or vegetables as general subjects are easily constructed, using stencil cutting as a teaching technique.

Conclusions

The time required for printing and cutting of stencils necessarily varies with the degree of complexity of the subject, and the number of reproductions required, as well as the skill of the students. It is the duty of the teacher to see that useful geographic subjects are chosen and that the time spent is not in excess of the value of the learnings.

The use of stencils as a core for a lesson organization gives the pupils the feeling of individual importance in the group because of their

contributions. Pupils can learn by playing a part. The stencil prints also provide the students with a permanent reference in the form of notes and outline illustrations that is always available for future use.

CHAPTER IX

PREPARATION OF CHALK DRAWINGS

Chalk Drawings Construction Method

"Anyone who has a clear geographic image of a physical feature in a landscape can draw it on the blackboard at least in diagrammatic form." No truer words have ever been spoken about chalk drawings and yet teachers hesitate to fully utilize their blackboards.¹

Proper use of chalk does not require that the teacher be an artist, though a few fundamentals of art are helpful. Most designs, other than those involving a circle, may be made with straight lines. The principal requirement is the ability to draw straight lines and to make the proper connections without hesitation. The four basic lines (Fig. VIII, A)² which are illustrated cover much of the scope of the usual drawings.

The best way to improve accuracy of drawing is to place dots in parallel rows on the blackboard and without hesitation make line connections between the corresponding dots. Simple or more complicated drawings may rise from these basic lines (Fig. VIII, B, C).

A well organized program of blackboard illustrations requires that maps, charts, graphs, and diagrams, other than very simple ones, be prepared before class time. However, this should take no more time than other types of class preparation.

Utilization of colored chalk and symbols will make maps and other presentations more appealing and comprehensible. Blue chalk denotes water; brown, elevations; and green, vegetation. Dots, dashes, and lines drawn

¹ David C. Winslow, "Geography with Chalk," Oklahoma Teacher, May, 1946, p. 17. Quoted from Wallace W. Atwood, Sr.

² Eliza H. Morton, Chalk Illustrations for Geography Classes, p. 6.

at various angles may be used if only white chalk is available. "A directional arrow, scale, legend, and title are necessary, natural additions for the sake of completeness."³

"It will be found very helpful to the teacher if a section of the blackboard is divided into equal squares using a dark blue paint that can be seen only a few feet from the board."⁴ Knowing the size of these squares the teacher can rapidly construct comparative diagrams (Fig. VIII, D). It will be found equally helpful to paint a circle on the board in yellow paint so that it may be seen plainly from all parts of the room. A circle can also be made very rapidly when needed by tying string to a piece of chalk and holding the other end firmly to the blackboard with a finger. Small circles may be drawn by holding the chalk between the thumb and the first finger and using the end of your little finger as a pivot.

The beginner who utilizes this entertaining and stimulating teaching device should not attempt landscapes and other more difficult pieces until the less complex forms such as cross sections or bird's-eye views of a country, or a banana plant have been mastered and have become natural and easy productions. After gaining experience and confidence in the so-called flat work, the more difficult depth drawings may be undertaken. However, many people have drawn pictures since their early school days and find perspective drawing easy.

Outside of the many drawings made with straight lines, there are a multitude of other presentations which are serviceable to the slightly more adept artist, and the unskilled artist with a little diligent practice. The

³ Winslow, op. cit., p. 17.

⁴ Morton, op. cit., p. 7.

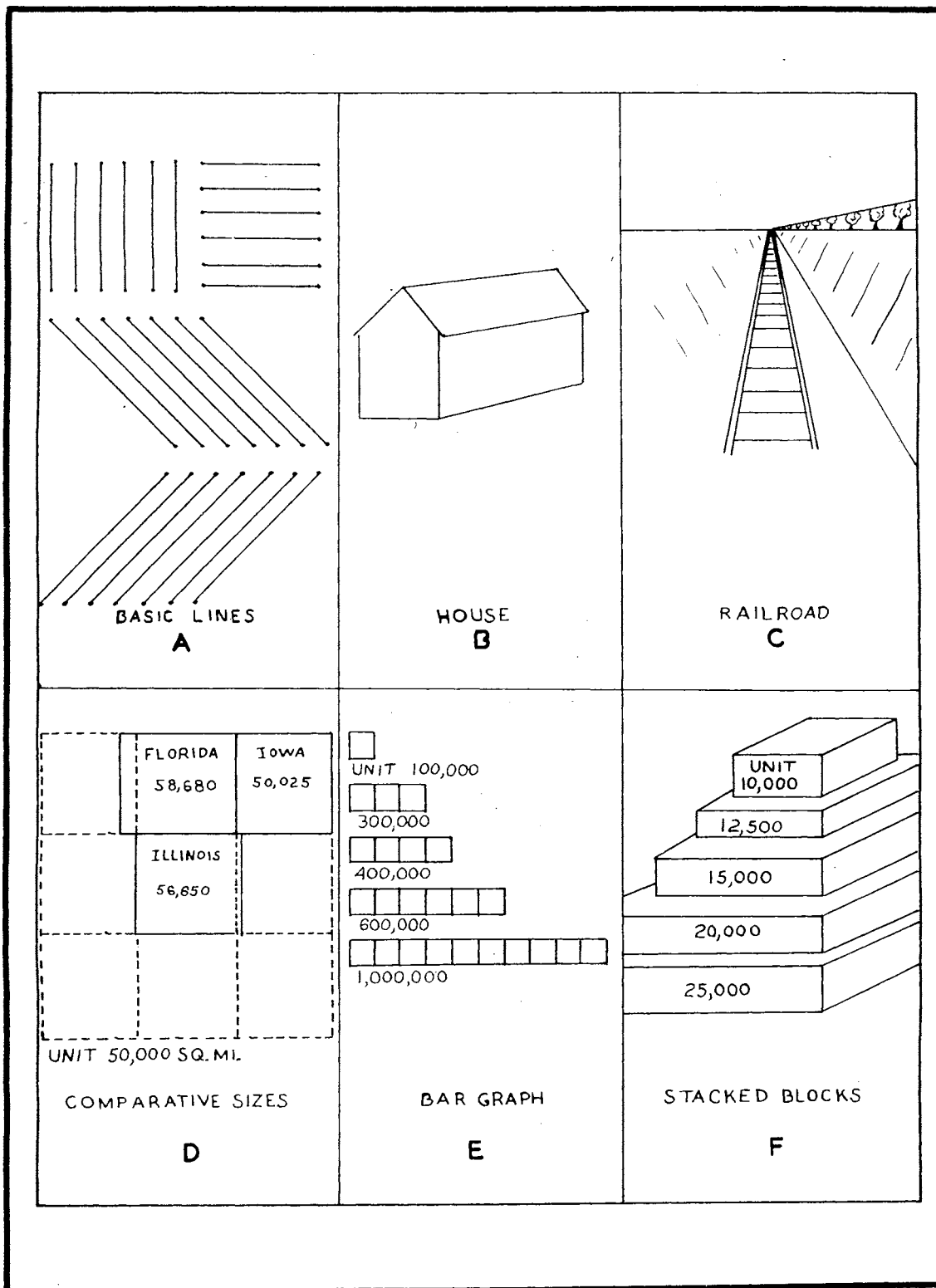


FIGURE VIII

The best effect is produced through reproduction of outlines and basic shadows. The illustrations of a mountain pass (Fig. IX, A)⁵ and an iceberg (Fig. IX, B)⁶ are good examples of quick, comprehensible sketches.

Comparison of foreign areas to home areas is one of the more effective ways of teaching relative sizes of various regions or countries of the world. A diagrammatic presentation of comparative sizes can be easily remembered (Fig. IX, C).⁷ A black outline map of the United States, one upon which chalk lines can be readily drawn and removed, is best for this type of illustration.

Other rapidly constructed devices may be employed effectively to show comparisons of figures, two such devices are the bar graph (Fig. VIII, E)⁸ and the stacked blocks (Fig. VIII, F).⁹

"A very effective way to obtain the outline of objects on the blackboard is to project a picture on the blackboard, using a slide projector or an opaque picture projector, and draw the outline and basic lines."¹⁰ Since this machine operates under dark conditions it is usually necessary to do the illustrations in advance of the class meetings. Another less accurate method but just as useful is to either make a copy of the original on paper to take to class, or to use the original copy. The outline is drawn

⁵ Morton, op. cit., p. 18.

⁶ Ibid., p. 51.

⁷ Charles F. King, Methods and Aids in Geography, p. 145.

⁸ Ibid., p. 152.

⁹ Ibid., p. 153.

¹⁰ David C. Winslow, "The Use of Maps in Classroom Instruction." Research paper presented to the Geography section of the District Meeting of the Oklahoma Education Association, February, 1941.

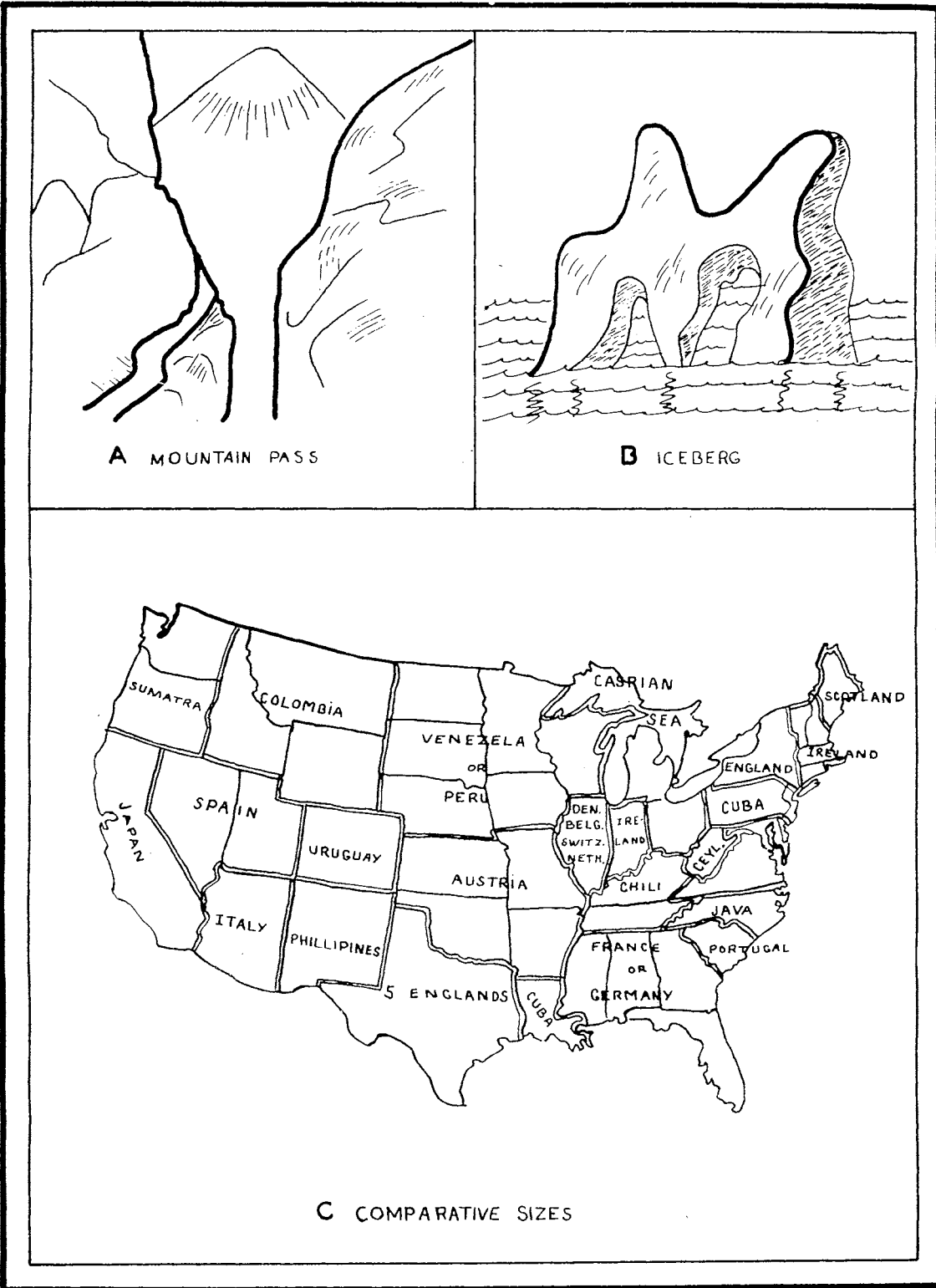


FIGURE IX

free hand by reference to the copy. Be sure to accompany each drawing with the necessary legend. The story of a map or chart is no more complete than its legend.

Class Use

Colored pencils and crayons in the hands of the pupils will stimulate interest since the pupils will be making diminutive reproductions in their notes. Those who display special talents should be permitted to use their talents in preparing full-scale blackboard drawings or other illustrations. A particularly adept student can make illustrations of a permanent nature as contributions to the visual aids equipment of the classroom.

Conclusions

Blackboard illustrations are not as popular with geography teachers as their simplicity and effectiveness deserve. For speed and clarity of presentation, there are few more useful methods than the correct use of chalk with large sized illustrations that can readily be seen from the far corners of the classroom. "The eye has been called the 'king of attention' and in picture language the 'native tongue' of the soul."¹¹

Geography requires the aid of illustrations in teaching as do few other branches of school study. The geography student, without the use of blackboard sketches develops only a few visual concepts that he can glean from the wall maps, textbooks, atlases, and globes. The very nature of printing limits the effectiveness of textbook illustrations and highly generalized wall maps. The instructor should not hesitate to use a chalk medium of expression when satisfactory representations can be made.

¹¹ Morton, op. cit., p. 5.

Since chalk drawings cost little, can be available for class presentation when needed, and form attractive, large-scale reproductions, they are particularly valuable in the teaching of geography. Maps lend themselves well to this method of preparation.

CHAPTER X

ADDITIONAL RECOMMENDED TEACHING DEVICES

The writer proposes to briefly discuss some teaching devices that are valuable in their contribution to geographic education, and have not been previously discussed in earlier chapters. Not all known methods are included, but only a few that were selected as being useful, inexpensive, and not too time consuming in their application. The names given to these additional methods, and the order of procedure in which they will be described are as follows:

- I. The class contributions file.
- II. Use of Living Materials.
- III. The Geography Hall of Fame.
- IV. Metal Tray Mud Maps.
- V. Handmade lantern slides.

I. The Class Contributions File.¹

The class contributions file, as the subject implies, belongs to the class. The teacher should aid only in a supervisory capacity allowing the students to do all the work. The recommended method for using this technique is to employ a committee system. Each different task is assigned to a committee. A list of committees such as a class might use, and their duties are:

- A. Trimming committee--to neatly cut around pictures and printed material preparatory to mounting.
- B. Preparation of mounts committee--to see that at all times there is

¹ Myrtle C. Schwartz, Personal Interview, October 17, 1949.

sufficient supply of cardboard or stiff paper mounts on which to paste new pictures and clippings.

- C. Pasting or mounting committee--to neatly arrange and paste the pictures and printed materials on the mounts.
- D. Labeling committee--to see that each mounted article or picture is properly labeled so that it may be easily filed, and returned to its correct file location after having been removed.
- E. Pressing committee--to see that each mounted article is pressed under a weight until dry enough to avoid warping and wrinkling.
- F. Filing committee--to see that all material is filed properly the first time, and refiled in correct location after having been used.
- G. Reference committee--to take from the files, materials requested by the students or teacher relating to the subject with which they are dealing.

The files are easily constructed of stiff pasteboard boxes. Each box should be the same size to permit the use of a universal size mount. Each file should be painted, a different color for each general subject, to add color to the room and to add more appeal to the students than is offered by the usual, drab-colored, brown, pasteboard box. One box should be prepared originally for each general subject, although at a later date it may be advisable to provide individual boxes for the larger group subjects.

General subject headings and sub-headings make filing simple and practical. The upper left hand corner of the back of the mount is a suitable location for the label. An example of a good label is as follows:

General Subject	Food
Group Subject	Grain
Specific Subject	Wheat
Special Topic	Cultivation

No trouble will arise in filing or refiling an article with a complete label. Other general subjects that may be used are transportation, textiles, fuel and power, holidays, animals, and people.

II. Use of Living Materials.

Plants and animals are used very satisfactorily as supplementary materials for day-by-day geography lessons, either independent of or associated with the topic of the lesson unit. An example for each unit may be available to one or more members of the class.

Examples may be cuts of the diverse grains, types of fruits and sprigs of fruit trees, or various types of plants and foods which they produce. Smaller animals as baby chicks, rabbits, and turkeys may be brought in if properly handled. Perhaps during the proper season, pelts of fur bearing animals, such as mink, muskrat, and beaver, may be brought for exhibition.

Daily lessons can be learned if students will bring pets or examples of wildlife they have found while on hikes, fishing trips, or visits to the country. Such materials may be snakes, turtles, frogs, fish, flowers, types of animal feed, types of water plants, or even different kinds of stones. Individually, these items may seem insignificant, but presented continuously for a whole semester or a year the contribution adds up to a great deal of supplementary, practical learning that is not part of the education which readily comes from books.

The committee system, which divides the many jobs involved in caring for living plants and animals among the majority of the pupils, may be satisfactorily employed. All facilities necessary for handling the various types of plants and animals should be ready for use as each item is submitted.

III. The Geography Hall of Fame.²

The geography hall of fame is among the simplest and yet most interesting teaching devices. Who are the men and women who contribute to the world's knowledge of geography? These world-wide contributors are the members of the geography hall of fame. No particular attention is paid to whether the individual's contribution to the science was small or large.

The procedure is simple. Each student brings in stories of explorers, scientists, authors, teachers, or laymen who they feel have made a contribution to the field of geography. The brief story of each individual selected should be written concisely. A small picture, or name plate if no picture is available, pasted on a sheet of unlined, bond paper, regular notebook size, adds to the interest. No story should cover more than one page.

The information that should appear with the picture is:

- A. Name, city, and country of the subject.
- B. Date of birth and death.
- C. His occupation or specialty.
- D. The particular accomplishment for which he is recognized in the field of geography.
- E. Name of the contributing pupil.
- F. Date the contribution is written and filed.

² Ibid.

Stories to be used may be found in any of our periodicals, in daily newspapers, or in official references. The teacher may offer a suggested list of persons to be written about to get the "hall of fame" started and to avoid the omission of prominent men in the field.

IV. Metal Tray Mud Maps.³

Metal tray mud maps are just what the name implies. They are maps formed out of soil contained in a water-tight tray. The mud map is a helpful technique because of its variety of uses. Three of these uses are:

- A. To study the work of water. Build most of the soil in the tray into a gradually sloping hill on one side of the tray. Water, when poured slowly and in a small stream on to the top of the hill, will show:
 1. Water erosion.
 2. Sedimentation.
 3. Water always seeks a lower level.
 4. If a constant level can be maintained at the bottom of the stream a delta will form as one of the results of sedimentation.
- B. To study economic geography. The soil may be molded into a map of a state, region, or country. Enough soil is used to make a layer at least two inches deep and actual seeds are planted in a pattern that will show actual crop distribution when the seeds germinate.
- C. To study relief. The soil may be used to display relief features of a state, region, or a nation. Small areas may be discussed at that time and the soil map modified or a new map of another area

³ Ibid.

constructed. Natural features may be remembered better if actually seen.

The materials for the metal tray mud maps are: (1) a light metal tray at least $2\frac{1}{2}$ inches deep and water tight, the depth should vary with the size of the tray; (2) enough soil to nearly fill the tray.

Students are the constructors of the maps and not the teacher. The metal tray mud map is a technique of the teacher but a preparation of the pupils. A sandbox is more desirable for very young children because it is cleaner to use.

V. Handmade Lantern Slides.

Lantern slides are an inexpensive, effective method of utilizing small-sized pictures or diagrams illustrated in textbooks or periodicals. By flashing them as enlarged reproductions on a screen, by use of a lantern slide projector, they are readily seen and the various features may be pointed out.

Six types of slides are in common use today.⁴

1. Etched glass slides.

Place the etched glass plate over the picture and trace the outline in light pencil strokes. Next, place the slide over a white sheet of paper and strengthen the lines and add colors if desired. Color is added in light even strokes which permit light to reflect through.

2. Plastic slides.

⁴ Mary Esther Brooks, "How to Make Handmade Lantern Slides" et. passim.

Trace off the desired picture in pencil on the plastic plate, then ink in the lines over a light table. Use a ruler for straight lines.

3. Translucent paper slides.

Trace the desired illustration directly on to paper with India ink or slide ink. Colored ink may be used effectively. Translucent slides are used for copying small areas of fine detail.

4. Gelatin-coated slides.

Wash the glass thoroughly and rinse it in hot water, and then in a weak ammonia solution. Gelatin of the common kitchen variety may be used. It is prepared by dissolving one-half teaspoon of gelatin in a small amount of water and diluting the mixture in one-half cup of water. One tablespoon of solution is spread on the glass surface with the fingers and allowed to dry. The technique is the same as is used in the preparation of plastic slides. Color may be added with India ink or slide ink.

5. Cellophane slides.

Carbon paper is folded around the cellophane and touches both the front and the back of the sheet with its printing surface. The printing or typing on the slide marks both sides of the cellophane and produces a clear imprint.

6. Silhouette slides.

Opaque silhouettes are cut out and mounted between glass plates. Colored cellophane mounted with the cutout may be used to add appropriate coloring.

Colored slide ink and slide crayons, when used, add to the life of the glass plate as they can be washed off in a solution of warm, soapy water.

All prepared slides are mounted with the printed surface, or prepared plate between two layers of glass. The mounted slide is bound around the edges with sticky paper to keep the slide intact and protect it from moisture damage. Slides are uniform in size and are easily filed for later use.

Class Use

The classroom value of these additional devices lies in their use as supplementary practices. Each recommended device may be utilized without disturbing the routine of previously outlined study units, and will serve to enhance the learnings of each unit by providing the class with up-to-date information and visual educational materials.

The materials made available will be used as prescribed by the teacher so that lesson organization is not disrupted. The textbook is not to become an item of secondary importance, overshadowed by the influence of one of the supplementary practices.

It is advisable to set aside a particular period of time to work on the additional recommended practices in order to assure that the undertaking will be carried on in a neat and conscientious manner, and not as a last resort to avoid less desirable classroom procedures.

Conclusion

Utilization of the various ideas presented in this chapter as devices for teaching geography will add interest to the subject and present the material in an effective, easily understood manner. The self-confidence, satisfaction, and enjoyment the students feel when allowed to use their own talents and resourcefulness are invaluable individual attitudes and a definite part of effective teaching.

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