A SEQUENCE PLAN FOR PREPARING CLASSROOM DISPLAYS TO PROMOTE LEARNING THROUGH CREATIVE ACTIVITY

A Professional Paper

Presented to

The Faculty of the Department of Teacher Education

Montana State College

In Partial Fulfillment

of the Requirements for the Degree

Master of Applied Art

by

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March, 1957

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CHAPTER I

INTRODUCTION

"Education has a two-fold purpose: to develop the personality and the capacity of the individual, and to effect an understanding 'between man and man'." (Read)[1]

Statement of the Problem

It is the constant concern of education and psychology to learn more about the development of the human mind and personality and with this knowledge to find better ways to promote learning in the schoolroom. It is the thesis of this paper that learning may be promoted by organizing the creative activities of children to produce classroom displays.

Justification for the Study

The development of creative activity in the human personality has been recently the subject of much investigation and reporting. Educators have become aware of the importance of developing the creative facets of the child's nature. In the classroom, however, creative activity is often confined to and confused with the "art" period. The teacher often lacks understanding of the immense importance of such activity, lacks knowledge, and lacks teaching techniques. In addition, he avoids creative activity because of the equipment needed and the "mess" involved.

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[1]Read, Herbert, "Education Through Art," from Education and Art, A Symposium, Edwin Ziegfeld, editor, UNESCO, 1954

The great variety of teaching devices called visual aids has become increasingly popular. It is their purpose to attract attention, to fix facts and understandings. Their effectiveness has been limited in that they are often costly, that they are often mechanical and so have a limited effectiveness, or are teacher-produced, and so are dependent on the available time, initiative and creativeness of the teacher. Moreover, it is the weakness of visual aids that student participation is often passive, and produces little active student experience.

The writer believes that creative activity involving materials can carry the student from the impersonal consciousness of a heard fact or concept into a personal exploration of the concept, and from there to a realization of the abstraction involved.

Further, the writer believes that when student accomplishment is displayed, personal incentive is provided, and the individual gains the confidence which results from the realization of his own value in the classroom community. There is a gain in social values when students learn tolerance, courtesy and appreciation for the efforts of others. Moreover, personality development takes place when the individual successfully works out creative problems in a non-competitive situation. Finally, the writer believes that classroom rapport is established in the creative atmosphere, and that the organization of the activity can, for students and teacher, give purposeful direction to the activities of the school day. Thus, creative activities can with organization become tools to develop subject matter and to provide for personal development.

Background of the Study and Review of the Literature

The sequence plan presented in the following pages is the result of several years of observation of the classroom display activities of teachers. During this period, the writer acted as art supervisor and teacher in a city with eighty-one classrooms of elementary and junior high school levels. To teachers, the organization of children and materials and time seemed to be a great barrier to the exploitation of creative activity as a tool for learning and personality development. Moreover, it was evident that, while most teachers were conscious of the desireability of integration of creative activities with subject matter, and realized the value of visual aids and recognition of individual achievement, the organization of all the elements into an orderly and attractive display took more time and thought than the pressure of the school situation allowed. The writer, therefore, spent much thought on the organization of creative activity techniques in such a way that classroom teachers could use them more readily. The attractive and informative bulletin boards in the classroom of Viola Robbins, a teacher in a third grade, started the writer on the series of studies which led to the present work.

In a search for classroom techniques for teaching the arts, the writer found that the educational practices of Cole[1] were both effective and valid. For an understanding of the unfolding of artistic

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[1] Cole, Natalie Robinson, The Arts in the Classroom, The John Day Company, New York, 1940

activity in the development of the individual, the work of Schaefer-Simmern[1] is fundamental. Lowenfeld[2] has made a thorough study of psychological and physical development as they relate to artistic activities. It is significant that all three of these authors discuss at length the positive effect on the personality of the artist when successful creative work is displayed. The discussion of display techniques by East[3] and of bulletin boards by Dent, Tiemann, and Holland[4] are valuable.

Objectives and Organization of the Study

It is the object of the writer to present a sequence plan which may be used to organize creative display activities, together with a list of tools and materials needed. A brief discussion of techniques, display devices and backgrounds has been included, as well as diagrams and sketches to extend the information in the text. Finally, a list of references containing useful information and classroom techniques has been added as a help in further developing creative classroom displays.

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[1]Schaefer-Simmern, Henry, The Unfolding of Artistic Activity, The University of California Press, Berkeley, 1948

[2]Lowenfeld, Viktor, Creative and Mental Growth, The Macmillan Company, New York, 1947

[3]East, Marjorie, and Dale, Edgar, Display for Learning, The Dryden Press, New York, 1952

[4]Dent, Charles H., Tiemann, Ernest F., and Holland, Nancy M., Bulletin Boards for Teaching, The Visual Instruction Bureau, Division of Extension, The University of Texas, 1955

CHAPTER II

A SEQUENCE PLAN FOR DEVELOPING CLASSROOM DISPLAYS

Much has been written about the value of creative activity, and about the value of visual aids. However, observation of the work of many teachers shows that, although these values may be admitted and accepted, the pressure of the classroom situation, together with inadequate training in the handling of materials, keeps many instructors from developing activities which would alleviate the pressure and improve learning conditions. Sequence plans for the teaching of reading and mathematical concepts have been worked out in detail by educators and publishers of textbooks, and their universal use testifies to their effectiveness. Analysis of the techniques of Cole[1] reveals the careful thought which she has given to the sequence of activity in order to arrive at satisfying learning. It is the hope of the writer that the following plan may be of use in organizing a display unit in the classroom.

Plan for a Display Unit

Step one: CHOOSE A GENERAL THEME covering a unit of work, and/or a SPECIFIC IDEA to fill an immediate need.

Step two: CONSIDER A COLOR SCHEME. It will make the display interesting looking and tie the thing together. PUT THE BACKGROUND MATERIAL IN PLACE IMMEDIATELY.

Step three: WORK OUT A CAPTION, or invent one. Ask a pertinent question, or use a line from a story or poem, or catch a phrase from

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[1]Cole, Natalie Robinson, The Arts in the Classroom, The John Day Company, New York, 1940

children's conversation.

Step four: LETTER THE CAPTION. Decide the size for the letters, and let some child do it. Or, if you must, do it yourself. Use cut paper, or a big brush and tempera paint. Or use commercial letters.

Step five: Together with the class, COLLECT MATERIAL. Find poems, pictures, quotations, cartoons.

Step six: MOUNT THESE IMMEDIATELY and temporarily, with imagination, and with pins instead of paste.

Step seven: ENCOURAGE DRAWING AND PAINTING TO ILLUSTRATE THE THEME. Display honest efforts with real appreciation.

Step eight: INVENT THREE DIMENSIONAL EFFECTS for variety.

Step nine: If this is an information display such as a large chart, graph, or map, USE such EMPHASIZING DEVICES as stars, underlining, arrows, personalized statistics.

Step ten: LABEL EVERYTHING. Use lettering of many kinds, in many sizes, so that the display will be interesting close-up as well as from across the room. Give credit for every contribution.

Step eleven: PROVIDE DEVICES FOR CONTINUING ACTIVITY--riddles, contests, assignments, references, questions.

Step twelve: DISMANTLE THE DISPLAY before everyone has tired of it. PUT UP THE BACKGROUND FOR ANOTHER immediately!

Restatement of Sequence Plan With Brief Discussion of Each Point

Step one: Choice of the theme. The early choice of subject matter is necessary to give direction to the activity. The display may be of a general type which can develop and change constantly as the work

progresses. The large sub-divisions in the text of a favorite teaching subject can be used for a general theme. Another type of display might supply periodic information on a particular subject—a daily almanac, a joke board, a posting of activities from the nation's capitol. Still a third type of display is that which treats of an immediate problem or situation. The learning of traffic regulations during National Safety Week might be such a problem in high school, while in the primary grades, the current phonetic problem can be illustrated.

Step two: Choice of a color scheme. In any display, color is used to attract attention and to elicit a pleasant reaction. A two or three color plan will give unity to the display. Color may be used for backgrounds, for lettering, for picture mounting. If the teacher feels some insecurity in choosing colors, the following hint is dependable: to make things show, (letters, for example) use light on dark or dark on light. Thus, yellow on dark grey has a luminous effect, and dark green on light blue is very legible. A third color, a bright one, may be added for a cheerful effect. Careful observation of the art work of children will show that some individuals have a special sensitivity to color. These students can be given the privilege of choosing color combinations for displays.

As soon as colors have been chosen, the background material should be arranged on the display site.

Step three: Working out a caption. After choosing the theme, the subject matter may be further limited by working out or inventing a caption. Discussion of captions and "copy" may take place during a language-arts period. A chapter heading may be used, or a line from a poem

or a story. Among the children in a classroom, there is often one who has a unique and interesting way of expressing himself. Remarks from children's conversation or a question asked by a student may be used as a headline. Such recognition of student importance can turn an unresponsive child into an ally.

The headline should be lettered immediately, and sub-heads worked out.

Step four: Lettering for display. Many types of lettering can be used for display purposes. Among these are cursive and manuscript writing, cut paper letters, oversize typewriting, novelty lettering, and commercially prepared letters.

Cursive writing done with a big bristle brush and black tempera paint on wrapping paper which has been lined with a staff-liner is quick, easy and effective. Students can learn to do this well after two or three sessions of practice on newspaper, using the columns as spaces. This practice in large size is valuable for students whose writing movements have not been perfected. Natalie Cole uses this technique of large size cursive writing as a tool to encourage creative expression among children of various racial backgrounds at fourth grade level.[1]

Manuscript writing, again with brush and tempera paint, is more legible than cursive writing. The standard manuscript alphabet as it is taught in the primary grades contains the basic strokes of cursive writing.[2] If therefore, there are students whose cursive writing is

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[1] Cole, op. cit.

[2] Freeman, Frank N., Handwriting Aid for Primary Teachers, Zaner-Bloser Company, Columbus, Ohio, 1955

illegible, the classroom display can be used as a device to reteach the basic strokes of the manuscript alphabet.

Upper grade and high school students should be able to use lettering pens and felt-nibbed pens with skill. The standard manuscript alphabet may be used. As students grow older, they will take pride in acquiring skills with special pens and alphabets. The single-stroke alphabet in Figure 1 has been developed for use with lettering pens for grade six and up. In this alphabet, the arrows indicate direction of strokes, while the numbers indicate sequence of strokes. Note that all vertical strokes move from the top downward, while all horizontal strokes move from left to right. When lettering, lines must be ruled for the upper, lower and middle of the letters. For uniformity of slant, it is necessary to sit squarely in front of the drawing surface, keeping the paper well away from the body, and slightly to the side. Vertical strokes are pulled straight down, the slant of the letters being controlled by the slant of the paper. The body position is kept the same at all times.

All leading typewriter companies manufacture typewriters with oversize type especially made to be legible for display use. These are invaluable for teacher-made signs, and for use by high-school students.

A basic cut-letter alphabet should be taught in grades one through six. The cut-letter alphabet shown in Figure 2 is simple, provides for a logical sequence of thought in producing each letter, and is useful for display work. In this alphabet, all letters except "I", "M", and "W" are the same width. Sheets of paper the size needed for the letters are cut, and a strip of heavy paper is used as a guide to standardize the width of letter parts.



Figure 1. Single Stroke Lettering Alphabet

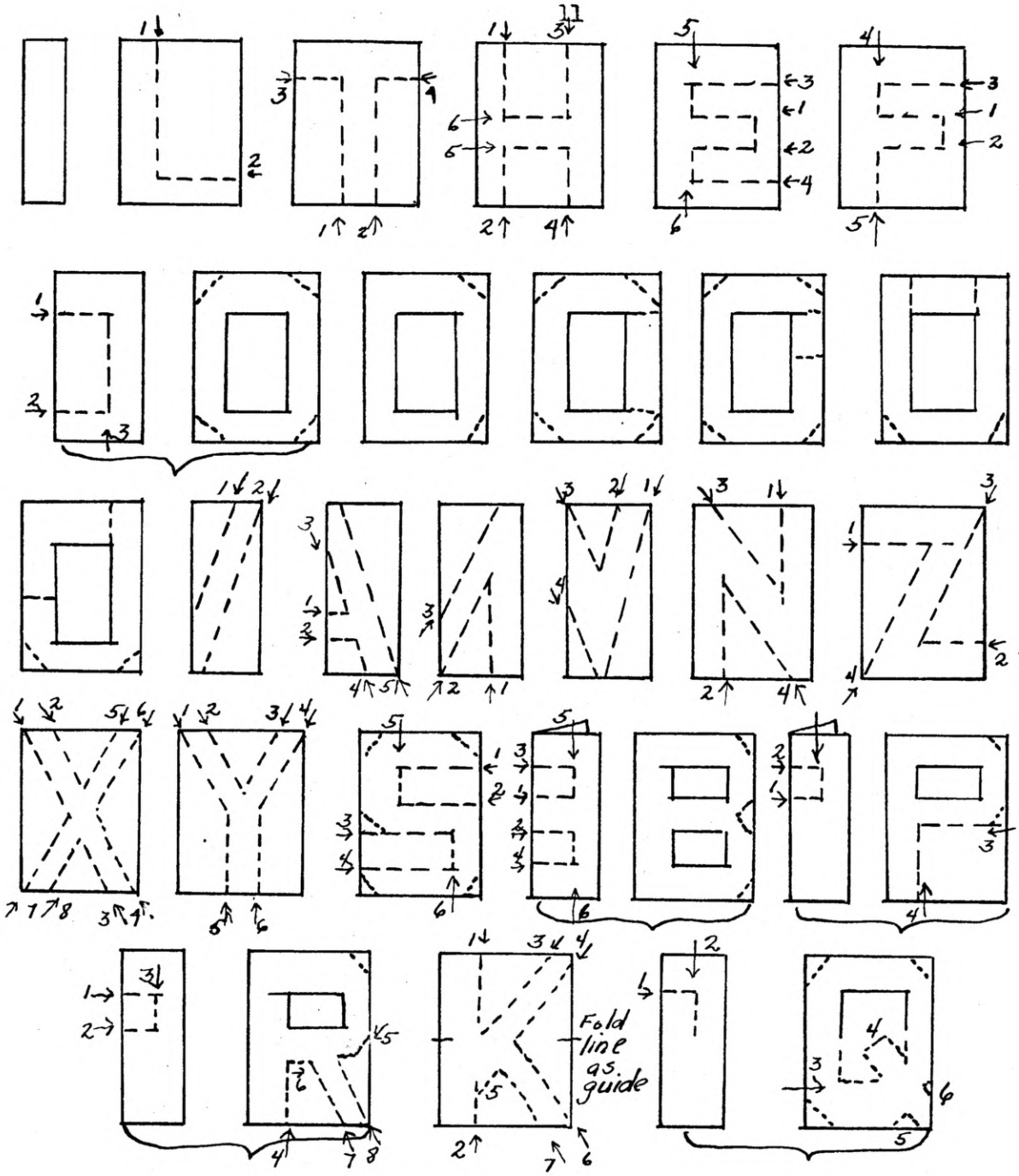


Figure 2. Simple Cut Lettering

On the chart, numbers indicate cutting sequence. Arrows indicate cutting direction.

After the basic alphabet is learned, letters may be designed and cut from a variety of materials: cloth, felt, cork, and plastic are a few of the useful materials. Cut-letter captions and alphabets may be stored in labelled envelopes for re-use.

School supply companies carry cardboard alphabets of the punch-out type in several sizes at low prices. These can be used "as is," or can be painted with tempera paint. They can be pasted or pinned to the display. Available from commercial art supply companies and library supply companies are three-dimensional plastic or composition letters in a variety of styles and sizes. These have pins on the back for securing to the display. They are relatively expensive, but are re-usable indefinitely.

Step five: Collection of materials. This is an important aspect of the activity. The following should be gathered and posted immediately: pictures to illustrate the theme; appropriate poems and quotations and jokes; pertinent vocabulary; cartoons and clippings. Children's and parents' hobbies can supply much interesting material, and give the child added prestige in the classroom. While materials must be primarily student-supplied, the unobtrusive hand of the instructor will point out sources, suggest applications, and as a last resort judiciously supply the items needed from a file reservoir before the project has a chance to lag.

Materials may be secured from many sources. Nature, science and travel magazines, and the picture sections of leading newspapers are valuable. A variety of free and inexpensive material is available,

much of it especially assembled for school use by commercial firms. State and national governments have an immense amount of educational material on every conceivable subject, practically for the asking. (See the section "Literature Cited and Consulted" for a list of sources.) Many leading magazines sell reprints of articles and pictures at a nominal fee, sometimes with plans for teaching. Some magazines have an educational films or an educational slides service.

Step six: Mounting of materials and arrangement of the display. The assembled materials should be mounted immediately and temporarily, using pins so that they can be rearranged as the display takes shape. Bulletin boards can be permanently marked along the edges with small ink dots to indicate one-half and one-fourth the length and height of the board. This will save hours in measuring for arrangement. Items should not be crowded, but rather may be changed from day to day. Small clippings may be grouped against a large colored shape to avoid a spotty effect. The names of all contributors should be posted.

The arrangement of the display can in itself provide for many special child needs. It can relieve the restless child of the physical constraint of sitting quietly. It can be valuable for the child who needs practice in making decisions. For children with a special ability in understanding space relations, and for the child who is a natural leader, display arrangement can give valuable practice and recognition.

Step seven: Drawing and painting to illustrate the theme. Every child has picture-making potential. Imaginative ideas should be encouraged, and honest effort accepted with thanksgiving. While this part of the project obviously provides for the child with special art

ability, the instructor must be alert to sensitive expression when it may not be associated with skill, and must be careful not to confuse beauty with neatness in student painting. Often highly imaginative, witty or humorous expressions are overlooked by the instructor with conventional art standards. In order to attain such expression in child painting, there is a necessity for an adequate and effective classroom procedure.

To insure a successful result when children paint, opportunity should be provided for preliminary work consisting of information drawings and small pencil compositions. Small drawings can be made on the previous day, so that when the actual work is undertaken, all the attention can be given to the painting.

Work must be large to be seen. Therefore, materials must be suitable for large work. For example, for water color or tempera painting, large brushes and newsprint in size 18 inches by 24 inches are desireable. For tempera painting, brown wrapping paper is even better. Newsprint is good for wet chalk work, but for dry chalk a more substantial paper is needed. No attempt should be made to make large compositions with wax crayons--too much time and effort is required to get the serface adequately covered. Wax crayons are not suitable for slick, white butcher paper. Cooperative murals ought not to be attempted on flimsy paper like newsprint or oatmeat paper. Heavy brown wrapping paper is better for this. Chalkboard can be used as a surface for painting murals with tempera paint.

When messy materials like chalk or water colors are being used, all adjacent surfaces can be covered with newspaper. Artists can work on the floor, or away from other students. Artists will find a

protective garment like an old, long-sleeved shirt useful, and should keep a wet cloth and a dry cloth handy for keeping hands reasonably clean, and for wiping up smudges.

Water color painting can be handled as follows: If the whole class is painting at the regular desks, materials can be placed on the chairs, and the paper on the desk tops. Students stand up to work. This will prevent spillage, and will allow the students to be far enough away from their work to see the composition as a whole. When painting, a paint cloth is used to clean the brush (dip and stroke, to keep the water clean.) A one-pound coffee tin will hold the water with little possibility for spilling. Painting should be done with as dry a brush as possible. A wet color should not be placed beside a wet color unless running is desired. Painting is done in strokes, leaving some white of paper showing through for sparkle. Two or three related colors in every area will give a rich effect. Even first graders can learn these techniques.

When students have learned to handle painting, a regular time should be provided for individuals to work, and a special place where they can work undisturbed.

If creative activity is to used as a tool for organizing classroom activities and for personality development in the individual, it is absolutely essential that the instructor have a thorough knowledge of the natural stages of development in design, drawing, and manipulative activities of children. Without understanding of what is suitable, and what can be expected at various age and maturity levels, it is most difficult for the instructor to observe with sympathy the drawing and

painting of children, and to refrain from "correcting" and "teaching" the "right" way to do it. In most academic subjects, the learning of children has been thoroughly studied, and it is traditional to match the complexity of the material presented with the maturity of the child. The very thorough researches of Schaefer-Simmern[1] and Lowenfeld[2] have revolutionized art education by their recognition and illustration of the stages of development in creative activity. (See Appendix I for illustrations of stages in drawing development)

When the child draws, he illustrates his stage of development. In drawing and painting for the classroom display, it is therefore essential that the instructor be able to judge and accept children's creative activity within the criteria of the best the child can do in a given time, with the given materials, at his stage of development--mental, artistic, manipulative and emotional.

Step eight: Use of three-dimensional effects. These add variety and interest to the appearance of the display, and provide opportunity for developing imagination in the use of materials. The effect of three dimensions can be obtained by using materials which have depth and texture--string, yarn, cork, corrugated paper. Paper letters may be raised above the surface by means of pins or paper braces. Little shelves of cardboard or more substantial materials will hold collections, potted plants or pieces of student sculpture. Small models

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[1]Schaefer-Simmern, Henry, The Unfolding of Artistic Activity, The University of California Press, Berkeley, 1948

[2]Lowenfeld, Viktor, Creative and Mental Growth, The Macmillan Company, New York, 1947

—either toys or of student construction—can be secured to the background. Paper sculpture has fascinating possibilities, and is so adaptable that it is widely used in commercial window displays. The book, How to Make Shapes in Space, by Toni Hughes, is a primer for paper constructions, and gives step-by-step instructions for basic shapes. The "shapes in space" which it describes are so adaptable that they can be used in the primary grades, or developed for decorating the ballroom for the local winter formal.

In working for special effects, it will be found that some individuals have a mysterious ability to think spatially, that is, in three dimensions, and to understand the functions of movable parts. Their gift is an important one—they are the future engineers.

Step nine: Use of emphasizing devices. Charts, graphs, maps and statistical lists need attention-getting devices. For divisions in such displays, color can be used as a distinguishing factor. Stars, arrows, and underlining can emphasize particular points. Graphs should be personalized by the use of drawings or silhouettes. Charts, graphs, and maps can be made of string supported by pins, for a three dimensional effect. Tiny plastic toys attached to the display can be attractive. The book, Display for Learning by Marjorie East, contains a detailed discussion of this type of display.

Step ten: Labelling and copy. Every contribution should be labelled with the name of the student concerned, giving tangible evidence of his part in the classroom community. Lettering should be used for titles, explanations, and instructions. If some items are lettered in small size, the display will be interesting close-up as well as at a

distance. Creative writing should be encouraged.

Step eleven: Devices for continuing activity. The display should not be allowed to remain static, nor even to arrive at a finished state. Drawings and paintings and illustrations should be changed frequently in order to recognize more people. Graphs, maps and diagrams can be made so that they can show progressive development. Assignments and library references can be added. Riddles and classroom contests may be posted.

Step twelve: The end, and a new beginning. Nothing is more tiresome to see than a room display that is passe. Students enjoy the chores involved in taking down the display. The instructor need not feel that this should be done on his own time. Many items such as cut lettering can be stored in labelled containers for future use. Colored paper backgrounds and scraps are re-usable. The momentum developed in the demolishing process should be used to put up a background for the next project.

CHAPTER III

TOOLS AND MATERIALS

Providing for Skills in the Use of Tools and Materials

Among the obstacles to carrying on creative activity with materials in the classroom are the problems of learning skills in handling of tools and managing of materials without unendurable mess. To avoid confusion and the frustration of unproductive activity, basic training is necessary in the handling of simple tools. A skill should be presented to the whole class first, with explanation and demonstration. It then needs to be repeated with variations until students can work without immediate supervision. The instructor must be specific about the mechanics of the skill, and the handling and care of materials, but should not quibble over results during this learning period.

Among the skills which should be taught as the need arises, and one at the time, are the uses of the small tools--the stapler, the paper punch, carving and cutting tools, brushes, lettering pens, and the dropper in the india ink bottle. Measuring with rulers and yardsticks, of both large and small areas, must be taught thoroughly. Display activity provides excellent application for this mathematical concept. The safe and accurate use of the paper cutter must be taught.

Material controls must be worked out so that confusion will not interfere with the creative process. "Messy" processes must be systematically learned. The handling of pastes and glues, and their proper drying are important. The protection of working surfaces, the handling of liquids in painting, and the cleaning up of accidental spills should be thought out and provided for. When the whole class is involved at the

same time, distribution of materials and clean-up must be understood by everyone before the activity is launched. Orderly and convenient storage of materials must be provided and made a habit.

Tools and Materials Needed in Preparing Attractive Displays

Cutting tools

Paper cutter--preferably 18 inch size

1 pair adult size scissors

1 pair of student scissors for each child

1 mat cutting knife, or a sharp, heavy-duty knife for cutting paper board

Spacing tools

Staff liner

Yardstick

T-square

Triangle--can be made of heavy cardboard

Long cord with tacks--to help line up letters

Fastening tools and materials

Stapler

Common pins

Thumb tacks

Upholstery tacks--useful for composition bulletin boards

Rubber cement

Plastic cement

Library paste

Claw hammer

Lettering materials and tools

For cutting large, medium and small letters, rectangles of black and colored paper in three sizes. Keep them in envelopes.

Cardboard strips to use as guides in letter cutting

Lettering pens and black drawing ink

Long handled brushes and tempera paint--powder type for mix-with water

Black crayons--they can be bought in bulk

If possible, a typewriter with oversize type

Mounting materials

Any heavy colored paper for backgrounds. Construction paper comes in sheets 24" X 36". Reusable many times. If the local school supply company does not list this size, it can be obtained through them by request.

A collection of novelty materials--colored cloth, burlap, corrugated cardboard, cheesecloth, felt, fancy wrapping paper.

Quantities of newspaper for pasting protection.

Scrap collection

This should include a variety of stuffs, two and three dimensional, which would add richness and interest to the display: bright yarn, string, wire, cotton, packing materials, used gift wrapping.

CHAPTER IV

PICTURE MOUNTING, DISPLAY DEVICES, AND BACKGROUNDS

Picture Mounting

Pictures may be framed in many ways. If a practice is made of having most paintings done on a standard size paper (18 inches by 24 inches is very good), work and materials can be saved by assembling three or four mats for pictures this size, and using the mats repeatedly. Many pictures should not be displayed at the same time, since the multitude obscures the value of the individual. Pictures ought not be hung so that they will be compared to each other--creative work should never be made a contest.

The simplest mounting is made of manilla tag, backed with cardboard. The painting in turn is backed by black paper one-half inch larger than the painting, allowing a margin of one-fourth inch around the painting. The four layers--painting, black paper, manilla tag, and cardboard are then stapled together. A margin of manilla tag at least three inches wide will give the painting importance. The painting should have a title and the artist's name must be lettered clearly. In order to save the mat, these may be lettered on a little card, and clipped to the mat.

A standard, fine mounting for paintings may be made from pebbleboard, in which a window just smaller than the picture is cut with a sharp knife. This frame is hinged to a backing of cardboard with gummed kraft tape, putting the tape inside, between the two layers. The painting is then attached to the cardboard back with cellulose tape. Students from grade six and upward can make variations of this mat in

less expensive materials and small sizes, and so turn this art activity into a practical problem in measuring and accurate execution.

Paintings may be mounted by using strips of corrugated paper for frames, measuring carefully, and mitering the corners. The picture is taped to a cardboard backing, and the frame stapled in place. Sixth graders can do this accurately if they are shown how to cut the corner by using a triangle for the proper slant. (A square corner folded in half makes the correct angle.)

Another very simple frame may be made by using the "C" in the chart of cut letters. Use rectangles of black paper of the desired size, and a cardboard strip as a cutting guide. This is suitable for first graders, and serves as a good introduction to letter cutting. For a bulletin board, no backing is necessary. Small objects can be cut out in silhouette, and pinned within the frame area. These frames can be double, of two colors.

Three dimensional mountings can be made by using shallow boxes for frames, or paper plates. Areas may be framed by using colored string pinned to the bulletin board. Celotex free forms with rectangles cut out to hold pictures are effective. Or a picture may be placed in the center of a long strip of paper, and the ends rolled to make a scroll.

Display Devices

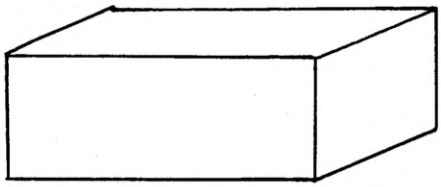
Small stands or pedestals show sculpture, models and ceramic pieces effectively. Such stands may be made in a variety of ways. Tin cans which are wider than they are high, such as sardine or tuna cans, or one-pound coffee tins, are useful. Cardboard match-boxes

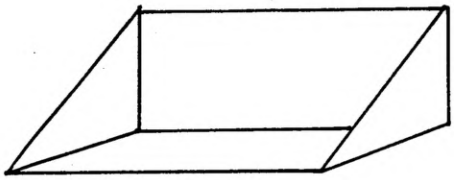
and small gift boxes may be collected. For very tiny models, wooden spools, short sections of doweling and sections of two by two inch lumber are useful. These can be covered with paper or painted in a neutral black, grey, brown or wood color. Models are safer if they are secured to the pedestal with rubber cement. The pedestal in turn may be secured in the same way to the display site.

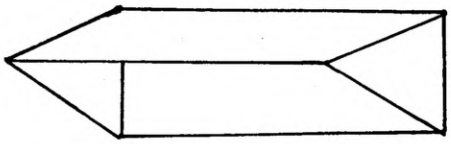
Three-dimensional treatment adds to the interest of the wall display, but some ingenuity is needed to add bulky items. Shelves of cardboard will hold small items such as mineral specimens. These can be cut from cardboard boxes, using the bottom of the box for the shelf, and one long side for the shelf support, while the ends of the box, cut diagonally, act as braces between shelf and support. A round container such as a salt box may be made into a niche-like shelf if it is cut in half vertically. (See Figure 3 for a variety of small shelves.)

Backgrounds

Small and temporary backgrounds. For table display of written work or tiny paintings, sections of insulating board or heavy cardboard may be hinged together with cloth tape to make a double easel. The edges may be bound with gummed kraft tape and painted for permanence. A similar table display background may be made of three sections of board--a center and two wings--hinged together to form a triptych, or screen. Sculpture, ceramics or constructed models may be displayed against this background. A section of matchstick bamboo such as a table place-mat may be used in a similar way. Such little stage settings give special recognition to individual pieces of work. (See Figure 4.)

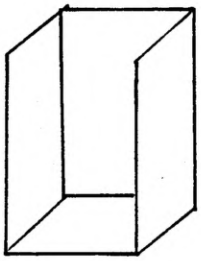


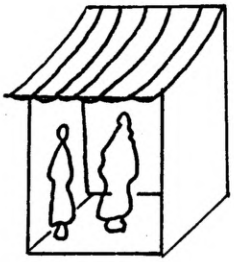


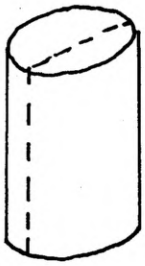


For a small shelf, cut away two adjoining sides of a long box. Cut the ends diagonally. Use the resulting shelf two ways.

Cut away the top and one side of a tall box. Cut the remaining opposite sides at a slant, and add a little roof. Nice to display little sculptures. Use larger boxes as play houses, garages and hangars for first and second grades.

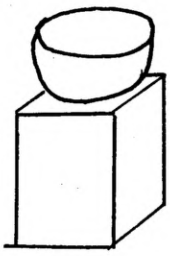








Make a little niche by cutting an oatmeal box in half lengthwise. Use a saw. Tack to a bulletin board, suspend from cord in groups, or stand on a table.



Make little stands from milk and cream cartons. Paint with tempera paint to which detergent has been added. Tack to bulletin board.

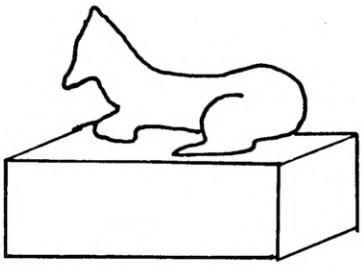
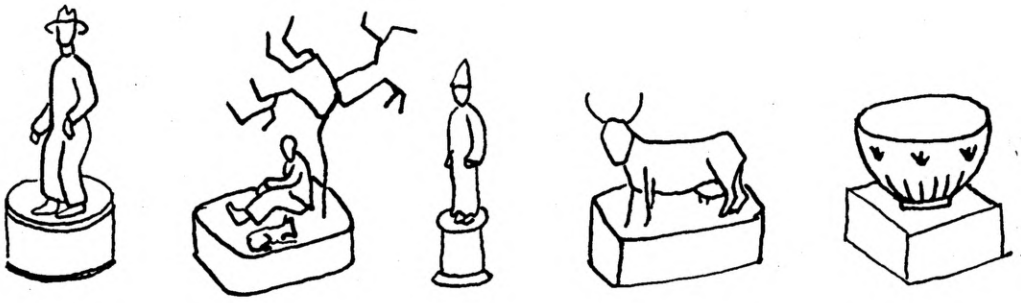
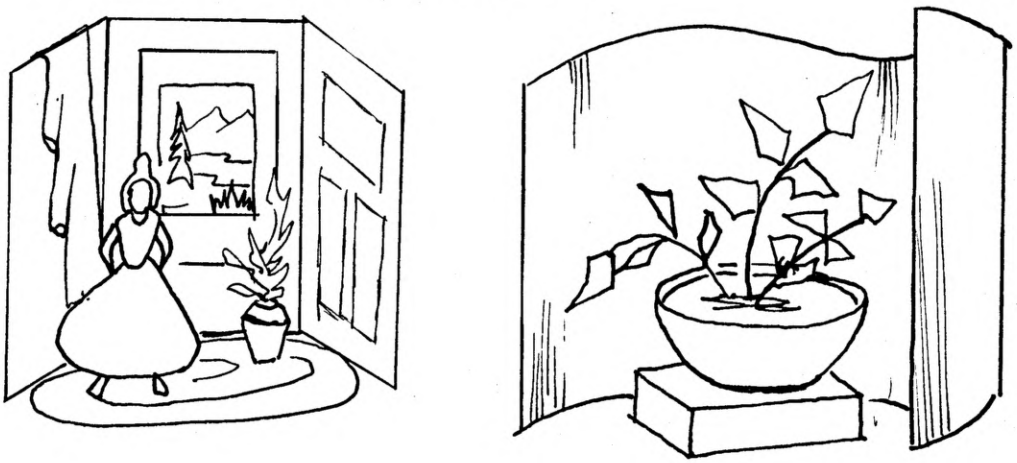


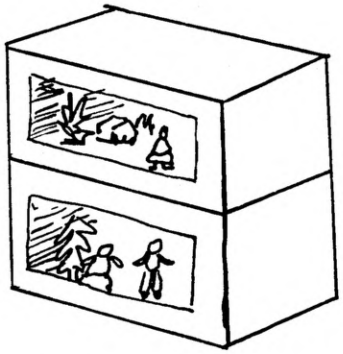
Figure 3. Shelves and Display Devices



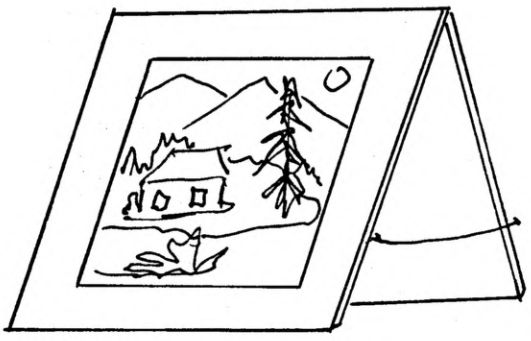
Small stands, such as tin cans, spools, sections of dowel or sections of board, can be painted or covered with paper, and used to display small three-dimensional objects.



A screen made of three sections of cardboard, or a bamboo placemat can be used to make a little stage background.



Shadow boxes can be made of shoe boxes. Stack for twice the effect.



A cardboard double easel can be used for table display of paintings.

Figure 4. Table Display Devices

For temporary display space, a window shade or screen made of slats can be hung against a wallspace. Wire hooks (a paper clip unfolded once will make one) can be used to hang items to this background.

Bulletin boards. The most common type of wall display space is the insulation-type board, used for pinned-up displays. In large size, that is, four feet by eight feet or larger, it is suitable for comprehensive units. In high schools there is a movement toward large, unbroken wallspaces of such material, serving as a real challenge for display work. In smaller sizes, such bulletin boards are suitable for treatment of current subject matter, such as posting of daily news, assignments, etc. The composition bulletin board is useful when attached to the backs of moreable bookcases, or made into sectional screens, to be used as room dividers.

Perforated hardboard is a versatile type of background. This material is available in large sheets of a neutral brown color, which may be painted, or can be bought in a variety of sizes, already painted and framed, for display purposes. A variety of hooks and braces and shelves are available, and the material comes in two weights, so that very heavy articles can be supported on it. The hooks or braces are inserted into the perforations, which are spaced at regular intervals over the entire surface.

A combination of insulation board and perforated hardboard makes an extremely versatile working surface. If the display board already in the classroom is entirely of the conventional insulating board type, its uses can be multiplied by having one or more sections of perforated hardboard permanently attached. These sections can be brightly painted to supply a basic color pattern. On the other hand, if the display

board is of the perforated material, one or more sections can be available of insulating board. These sections can be attached where and when they are needed to serve as backgrounds for clippings, small paintings and handwritten material. (See Figure 5.)

A tackboard can be made more useful by having a shelf of six-inch lumber attached at the lower edge, and if possible, a similar shelf of four-inch lumber attached at the top. These will serve to support three-dimensional objects and books related to the display. In addition, if screw-eyes or tacks are placed at two inch intervals along the edges, string or yarn may be run from top to bottom to form screens, divisions, and supports for mobiles, puppets, and lightweight models. (See Figure 6.)

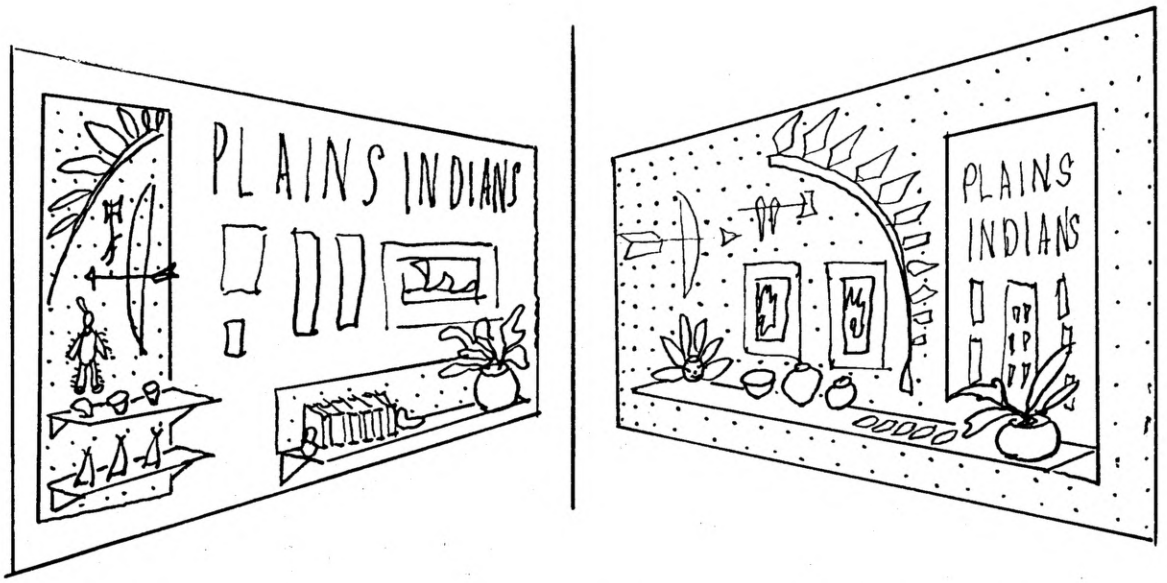


Figure 5. Bulletin Boards Showing Combinations of Perforated Hardboard and Insulation Board

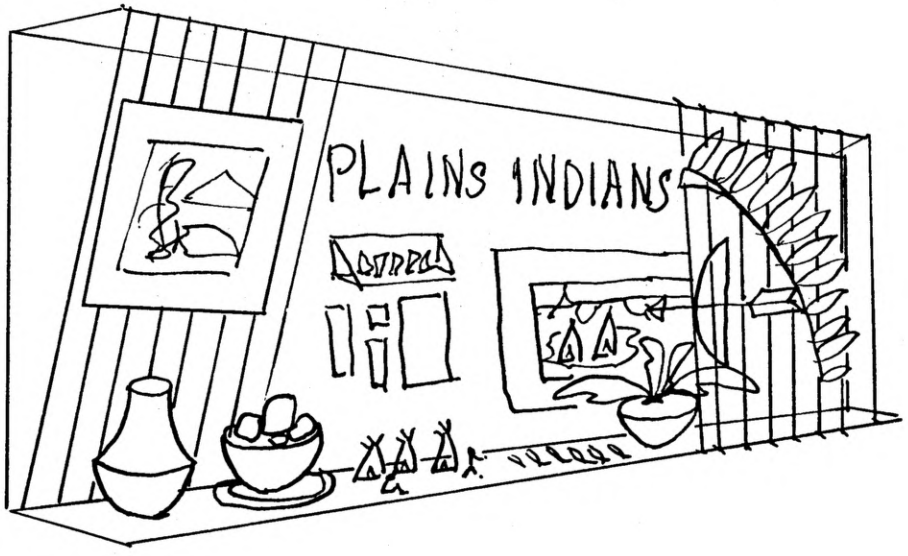


Figure 6. Bulletin Board Arrangement with Upper and Lower Shelves Attached.

CHAPTER V

CONCLUSION

It should be noted that no formal "art" principles have been included in this manual. Rather, the emphasis has been on the means to achieve--the techniques and the sequence of activities involved to arrive at learning and personality development. While the writer is conscious that principles of art exist, it is felt that these for the child must be conclusions, and should be arrived at through the free and successful and discriminating practice of creative activity. The superficial imposition of such principles upon the child's current stage of development will merely lead to frustration. It is felt that the insistence on principles before any expression has been achieved would have the same inhibiting influence as would the insistence on the production of a fine, pear-shaped tone on a child who has just discovered that he can produce a reasonable facsimile of a melody.

That the product is of secondary importance to the growth which results within the individual from the process is axiomatic in education. It must not be ignored, however, that to the student, the satisfying product is the immediate goal. It is therefore of greatest importance that the instructor understand the s equence of activity and techniques which will result in learning and in a satisfying end product. The instructor must have a thorough understanding of the developing process, but must require of the student discrimination and judgement of the end product--this in accordance with the student's understanding. The student's judgement of the end product is the criterion of success or failure in learning.

That creative activity is important in the development of intelligence is discussed by Dewey as follows:[1]

> . . . because perception of relationship between what is done and what is undergone constitutes the work of intelligence, and because the artist is controlled in the process of his work by his grasp of the connection between what he has already done and what he is to do next . . . he has to see each particular connection of doing and undergoing in relation to the whole that he desires to produce. To apprehend such relations is to think, and is one of the most exacting modes of thought.

While not taken into account by the usual tests for intelligence, the fact that creative, artistic ability and its sequence of development is an important and universal facet of human intelligence has been demonstrated by Schafer-Simmern. The positive effect of the development of this intelligence on the personalities of individuals, and on their adjustment to their environments, including their ability to sustain activity over long periods, and to alter their attitudes on cooperative work, is significant when considering means for promoting learning in the classroom. Ziegfeld has this to say about the place of creative activity in education:[2]

> Art education, in response to modern forces and new conditions, has in recent years taken on deeper meanings and broader purposes, and has moved from a peripheral to a central position in education. . . Its new significance springs from the necessity of maintaining the dignity, uniqueness, and integrity of the individual in a world where these traits are faced with extinction. . . In placing primary value upon the experiences and feelings of the

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[1]Dewey, John, Art as Experience, Minton, Balch Company, New York, 1934, p. 45

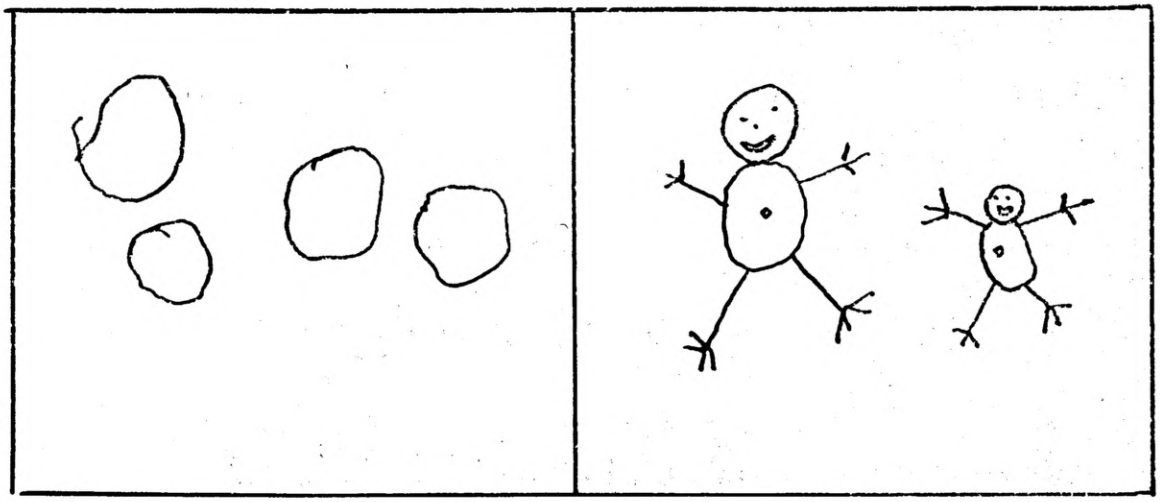
[2]Ziegfeld, Edwin, editor, Education and Art, A Symposium, The United Nations Educational, Scientific and Cultural Organization, 1954, pp. 15-16

> individual, art activity establishes the creator as being different from every other person. Creative activity enables an individual to clarify his experiences, to determine his relation to occurrences and events and frequently to reconcile conflicting forces to which he may be subjected. Art thus becomes a powerful instrument of personal and social integration.

It is the belief of the writer that with a group of simple skills and tools, a basic knowledge of artistic development, and an organized sequence of activities, the classroom teacher will be able to use creative display activity as a tool for learning and personality development.

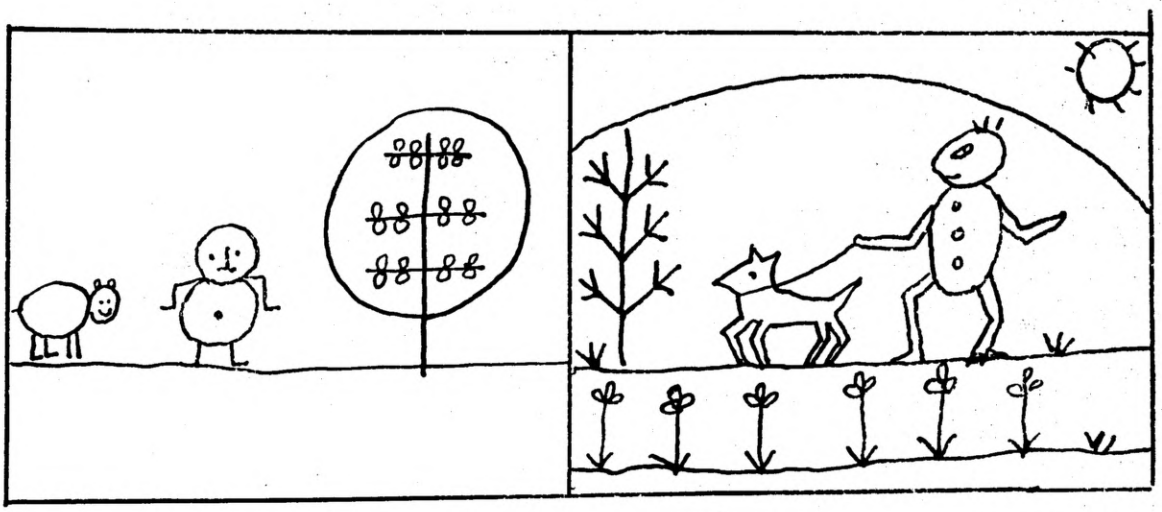
APPENDIX I

THE STAGES OF VISUAL CONCEIVING



(a) A three-year old often makes roundish forms like these.

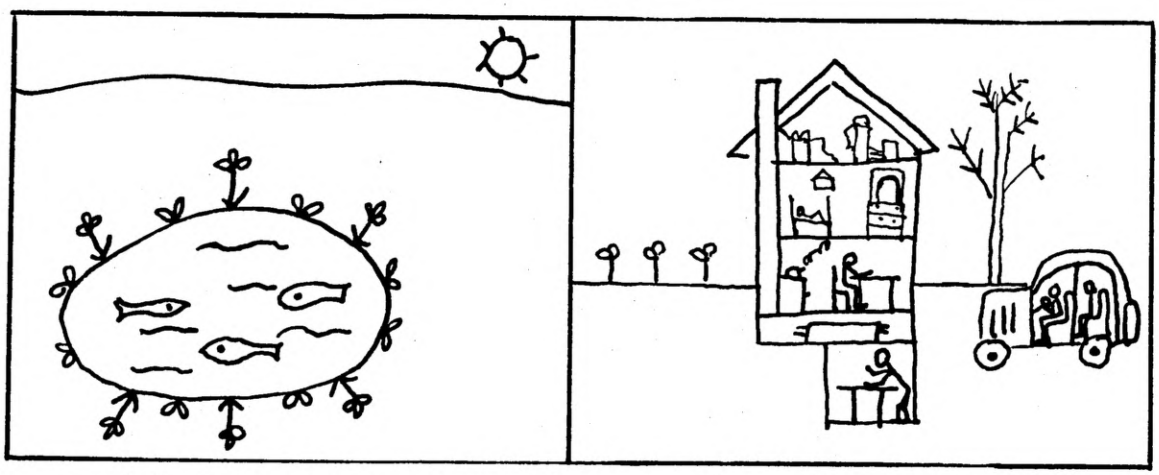
(b) A five-year-old often makes "people" like this.



(c) A child ready for first grade arranges things on a base line. He uses a horizontal-vertical arrangement.

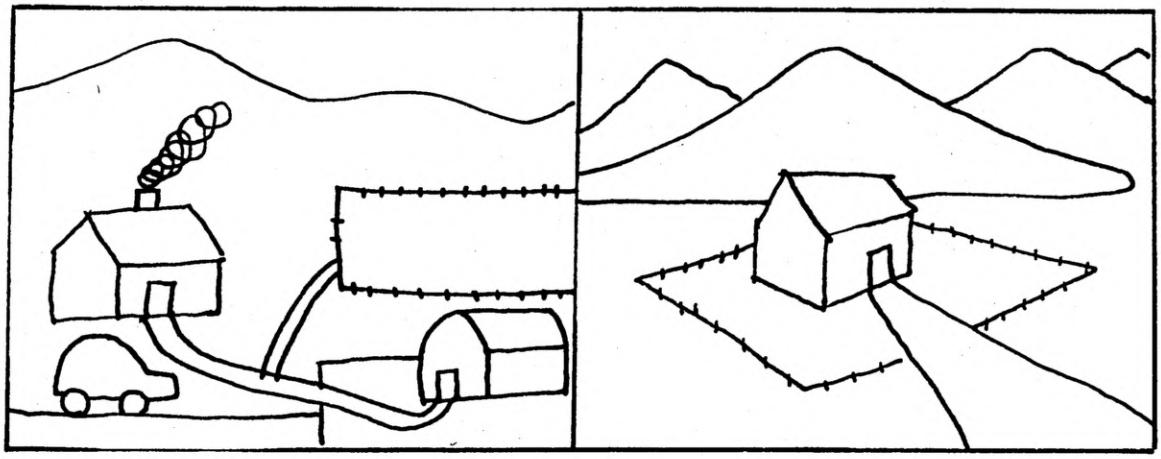
(d) A second grader may work like this. The angle of joinings is important. So is the double ground line.

Figure 7. Schematic Drawings Showing Progressive Development



(e) During early and middle grades, children use this sort of arrangement to show area.

(f) During middle and upper grades, the X-ray picture is a common way of showing action with-in an enclosed space.



(g) This a transition stage between (e) and (h). It is an attempt to show the third dimension. Common during middle grades.

(h) Two important developments are shown here: overlapping, and the use of the slanted line to carry the eye into space. Begins in the upper grades.

Figure 7. (Continued) Schematic Drawings Showing Progressive Development.

The above drawings are derived from the work of Schaefer-Simmern. All stages must be considered "right", and the next step must be allowed to develop, since it is a matter of understanding, not information.

APPENDIX II

LITERATURE CITED AND CONSULTED

Boroughs, Homer, SOURCES OF FREE AND INEXPENSIVE INSTRUCTIONAL MATERIALS FOR NORTHWEST TEACHERS, published for the College of Education by the University of Washington Press, 1951

A mimeographed pamphlet of 46 pages, which sells for fifty cents, arranged by subject, and containing, in addition to addresses and prices, a brief discription of the materials.

Carlyle, Paul, and Oring, Guy, LETTERS AND LETTERING, Mc Graw-Hill Book Company, Incorporated, New York, 1938

Modern lettering design, interes ting for teachers and for high school students.

Cole, Natalie Robinson, THE ARTS IN THE CLASSROOM, The John Day Company, New York, 1940

A charming and pedagogically sound discription of techniques for teaching the creative arts to fourth grade children of mixed racial backgrounds.

Dent, Charles H., Tiemann, Ernest F., and Holland, Nancy M., BULLETIN BOARDS FOR TEACHING, The Visual Instruction Bureau, Division of Extension, The University of Texas, 1955

Attractive, modern design pamphlet of a series called "Bridges For Ideas". Much information on bulletin board techniques presented with an economy of words. Price, $1.00.

Dewey, John, ART AS EXPERIENCE, Minton, Balch Company, New York, 1934

Basic art education philosophy.

East, Marjorie, and Dale, Edgar, DISPLAY FOR LEARNING, The Dryden Press, New York, 1952

Comprehensive discussion on making and using visual materials.

Educators Progress Service, ELEMENTARY TEACHERS GUIDE TO FREE CURRICULUM MATERIALS, Thirteenth Annual Edition, Randolph, Wisconsin, 1956

Cyclopedic listing by subject, with analysis of materials and unit plans for use. Should be available in every school system. 318 pages. Price, $5.50.

Freeman, Frank N., HANDWRITING AID FOR PRIMARY TEACHERS, Zaner-Bloser Company, Columbus, Ohio, 1955

Contains standard versions of both the manuscript and the cursive alphabets.

George, Ross F., SPEEDBALL TEXT BOOK, The Hunt Pen Company, Camden, New Jersey, 1948

The stroke-by-stroke fundamentals of lettering with pens or brushes. Contains dozens of alphabets. Very good for instructors and high school students. Price, fifty cents.

George Peabody College for Teachers, Division of Surveys and Field Services, FREE AND INEXPENSIVE LEARNING MATERIALS, Nashville, Tennessee, 1956

Paper bound, comprehensive listing by subject matter. 244 pages, price, $1.00.

Hughes, Toni, HOW TO MAKE SHAPES IN SPACE, E. P. Dutton and Company, Incorporated, New York, 1955

Step-by-step instructions for making basic forms for paper sculpture and mobiles. Charming, modern, and good for developing thinking three dimensions.

Keiler, Manfred L., ART IN THE SCHOOLROOM, University of Nebraska Press, Lincoln, Nebraska, 1951

Very good in suggesting a variety of subject matter for children's pictures. Unimaginative in use of materials, and does not exploit the possibilities of design and composition in children's work.

Lowenfeld, Viktor, CREATIVE AND MENTAL GROWTH, The Macmillan Company, New York, 1947

Basic textbook on art education. Detailed discussion of child development, together with techniques for teaching.

Randall, Arne W., MURALS FOR SCHOOLS, The Davis Press, Inc., Worcester, Massachusetts, 1956

Good for its discussion of materials and how to handle them.

Read, Herbert, EDUCATION THROUGH ART, Pantheon Books, New York, 1945

A psychological interpretation of child art.

Superintendent of Documents, UNITED STATES GOVERNMENT PUBLICATIONS MONTHLY CATALOG, United States Government Printing Office, Washington 25, D. C.

A list of all government publications, with prices, listed by subject matter. Twenty-five cents per copy, $3.00 per year.

Schaefer-Simmern, Henry, THE UNFOLDING OF ARTISTIC ACTIVITY, The University of California Press, Berkeley, 1948

Research into the developmental stages in art activity. An important book for all educators.

Tomlinson, R. R., PICTURE AND PATTERN-MAKING BY CHILDREN, The Studio Publications, New York, 1950

Contains many illustrations of children's paintings and designs. Valuable if the pictures are studied in connection with the reading of Schaefer-Simmern and Lowenfeld.

Ziegfeld, Edwin, editor, EDUCATION AND ART, A Symposium, published by the United Nations Educational, Scientific and Cultural Organizations, 1954

A discussion of art education in world culture in the present. Illustrations include paintings and activities of children of many lands.

QUESTION 2: How many classes of science do you teach per day?

Total_____ number of students?_____

RESPONSE:

Class	Average Number of Students per Class	Number of Classes of Science Taught per Day	
I	25.7	00.0%	6
		64.3%	5
		14.3%	4
		10.7%	6
		3.6%	3
		7.1%	2
		00.0%	1
II	22.9	3.6%	7
		39.3%	6
		28.5%	5
		17.9%	4
		3.6%	3
		3.6%	2
		3.6%	1
III	15.1	8.0%	6
		20.0%	5
		12.0%	4
		20.0%	3
		32.0%	2
		8.0%	1

INTERPRETATION;

Seventy-five percent of the Class I science teachers teach 5-6 classes of science per day. The remaining 25% teach from 2-4 classes

of science per day, but they teach other areas as well. (See Question number 3.) The average number of students in the Class I science classes is 25.7.

Seventy-one point four percent of Class II teachers teach 5, 6, or 7 classes of science per day. The remaining 28.6% teach from 1-4 sciences classes per day, but they teach other areas as well. The average number of students in the Class II science classes is 22.9.

Twenty-eight percent of the Class III teachers teach 5-6 classes of science per day. The remaining 72% teach other areas as well. The average number of students in Class III science classes is 15.1.

QUESTION 3: What other subjects are you teaching this year? None___,

Math____, PE____, Other _____
(Explain)

RESPONSE:

Class I - 67.9% are teaching only science classes
14.3% are teaching math and science classes
7.1% are teaching PE and science classes
7.1% are teaching research, photography, A-V, or other mini-courses in addition to science classes
3.6% are teaching geography and science classes

Class II - 57.1% are teaching only science classes
17.9% are teaching PE, health, and drug education in addition to science classes
21.4% are teaching high school science courses, social studies, photography, reading, activity periods

and traffic education in addition to junior high science classes

3.6% are teaching math courses in addition to science classes.

Class III- 52.0% teach numerous classes such as English, reading, social studies, library science, driver education, history, geography, lapidary, and one serves as principal in addition to teaching science classes. 56% of the teachers teach at least two and no more than three of the above classes in addition to their junior high science classes

16.0% teach PE classes in addition to their science classes

12.0% teach math classes in addition to science classes

8.0% teach English in addition to science

4.0% teach home economics in addition to science

8.0% teach only science.

INTERPRETATION:

Forty-five point seven percent teach only science classes. Fifty-four point three percent teach other areas as well as science. In Class I and II schools, the greatest percentage of science teachers teach only science classes. In the Class III schools, the greatest percentage teach from 1-3 other areas as well.

QUESTION 4: How many years of teaching experience do you have?

(Include this year)

RESPONSE:

Class	Average years of experience
I	10.8
II	7.5
III	7.0

INTERPRETATION:

The average number of years of teaching experience is 8.5 years. Class I teachers average more years experience than Class II, and Class II average slightly more years of experience than Class III teachers.

QUESTION 5: How would you describe your school's physical facility?

Open space_____ Traditional_____, Other_____

RESPONSE:

Class	% Open space	% Traditional	% Other
I	0.0	100.0	0.0
II	10.7	82.1	7.1 combinations
III	0.0	100.0	0.0

INTERPRETATION:

Ninety-three point eight percent teach in traditional facilities. Three point seven percent teach in open space facilities, and 2.5% teach in a combination of the two. Five percent of the teachers made additional comments about the lack of equipment available to them and the poor condition of their teaching facility.

QUESTION 6: With what other school or community activities do you assist?

Science club_____, Sports program_____ Other____
(Name sports)

RESPONSE:

Fifty-nine point three percent of the science teachers assist with PE related activities. These activities include football, basketball, wrestling, track and cross country, swimming, cheerleading, serving as athletic director and coach, softball, and adult sports recreation programs.

Eight point six percent of the science teachers assist with science related activities such as science club sponsors, science fair directors, rocket clubs, and airplane clubs.

Eight point six percent assist with church and community organizations such as leadership roles in their churches, Elks, Eagles, Moose, Kiwanis, Delta Kappa Gamma, Lions, and Jaycee organizations.

Six point two percent assist with educational organizations and serve on Professional Rights and Responsibilities Committees, Montana Education Association committees, or they serve as officers of their educational associations.

Four point nine percent assist with language arts and school government activities. Language arts activities include library club, yearbook sponsor, and speech club.

Four point nine percent assist with miscellaneous activities such as flytying, chess, saddle club, music activities and photography.

Three point seven percent assist with guidance activities and serve in the capacity of student counselors.

Eighteen point five percent assist with no other activities in the school or community.

INTERPRETATION:

Eighty-one point five percent of junior high school science teachers assist with church, community or extra-curricular school activities.

Eighteen point five percent of junior high school science teachers assist with no other activities in the school or community.

QUESTION 7: How would you describe your method of teaching science?

Lecture only____, Lab-lecture, (List approximate percent of time devoted to each: Lab____% Lecture____%) Individualized continuous progress_____ Other_____

RESPONSE:

Lecture Only	Lab-lecture	Individualized continuous progress	Other
1.2%	87.5%	3.8%	7.5%(combination)

INTERPRETATION:

The greatest percentage of teachers use a lab-lecture combination in their science teaching. The ratio of lab to lecture is 39.8% laboratory work to 61.2% lecture.

QUESTION 8: Are you male or female? ____ How many grade 7, 8, or 9 female science teachers are employed in your school? (Do not include yourself.) How many grade 7, 8, or 9 male science teachers are employed in your school?_____ (Do not include yourself) (This question will be used to ascertain if the sample taken represents the total state male/female science teacher ratio.

RESPONSE:

Male - 84% Female - 16%

INTERPRETATION:

It was not possible to determine if the male/female ratio was representative of the Montana state junior high science teacher ratio because, according to James Burk, Supervisor of Secondary Education in the Office of the State Superintendent, this information is not available.

QUESTION 9: Have any of your students (during the time that you had them in class) entered any type of science competition? ____ If yes, what type?
Local____ State_____ Industry sponsored____ National_____

RESPONSE:

Class	Yes	No	Zone	Yes	No
I	57%	43%	Northern	47.8%	52.5%
II	50%	50%	Southern	42.0%	58.0%
III	67.7%	33.3%	Eastern	42.0%	58.0%
			Western	65.0%	35.0%

Of the 49.4% who had students enter competition, 25% were national competition entries, 52% were state, and 90% were local entries or combinations thereof.

INTERPRETATION:

More Class III science teachers have had students enter science competition than Class I or II. More Class I science teachers have had students enter science competition than Class II. There are more teachers in the Western zone who have had students enter competition when compared with the other zones. Overall, 49.4% had students enter competition and 50.6% had not.

QUESTION 10: How have you been made aware of competition possibilities?

Letter___, Newspaper___, Magazines___, Radio___,

Other_____

RESPONSE:

Letters	49.4%
No Information	22.2%
Other Ways*	9.9%
Newspaper	7.4%
Letter and Newspaper	6.2%
Letter, Newspaper, and Magazine	3.7%
Magazines	1.2%

* (MEA meetings, general knowledge, school board, science fair director, initiated own competition)

The greatest percentage of teachers are made aware of science competition by letters from those planning the competition. Fourteen

point three percent of the teachers in the Class I schools stated that they had never been made aware of competition. Twenty-five percent of the teachers in Class II and twenty-eight percent of those in Class III schools stated that they had never received competition notification.

QUESTION 11: Were you as a student, ever involved in science competition?

_____. If yes, please comment on the positive or negative aspects of your experience.

RESPONSE:

Thirty-seven percent of the teachers had, as students, been involved in science competition. Fifty-three point three percent of them stated that they had positive feelings about the values of participation. Sixteen point seven percent said that they could not remember their feelings or made no comment. Thirty percent had negative feelings.

Those who had positive comments stated that it was a good experience for the poorer student as he was able to experience of success, and that it challenged their own interest in science enough so that they went into a science teaching career. One teacher who expressed positive feelings did state that he had reservations about the amount of parental help necessary for a successful project.

One teacher who had negative comments stated, "I have a negative view---90% of the winners did only a small percent of the work." Another stated, "It was wrong. Competition among parents, not students," Another said, "The long drawn-out time period always discouraged me before I finished."

QUESTION 12: Do you feel that it is important to encourage student participation in science competition?

Yes____, No____, Uncertain_____

RESPONSE:

Class	Yes	No	Uncertain	Zone	Yes	No	Uncertain
I	57.1%	17.9%	25.0%	Northern	65.2%	0.0	34.8%
II	46.4%	17.9%	35.7%	Southern	42.1%	21.0	36.8%
III	52.0%	12.0%	36.0%	Eastern	36.0%	21.1	42.1%
				Western	60.0%	25.0	15.0%

INTERPRETATION:

Overall, 51.9% of the teachers felt that it was important to encourage student participation in science competition. Sixteen percent felt that it was not, and 32.1% stated that they were uncertain. More Class I teachers felt the importance of science competition encouragement, and by geographic zone, more teachers in the Northern and Western zones felt that it was important to encourage science competition.

QUESTION 13: A. Do you believe that teacher preparation programs in college should include training the philosophy of science competition and ways to involve and assist students?

Yes____, No____, Uncertain_____

B. Did your teacher education program provide such training?

Yes____, No____, Uncertain_____

RESPONSE:

	Yes	No	Uncertain	
A.	60.0%	17.5%	22.5%	(1 teacher did not comment)
B.	15.2%	78.5%	6.3%	(2 teachers did not comment)

INTERPRETATION:

Sixty percent of the teachers stated that they do believe that teacher education programs should include training in guiding science competition, and 78.5% stated that their teacher education program did not do so.

QUESTION 14: Do you believe that some teachers may willfully withhold science competition information from students because the teachers themselves are not interested in the activity or do not have time to devote to it?

Yes____, No____, Uncertain_____

RESPONSE:

Yes	No	Uncertain	
62.0%	21.5%	16.5%	(2 teachers made no comment)

QUESTION 15: A. Should teachers receive additional monetary compensation for sponsoring students in science competition? (Such as that received by coaches of sports)

Yes____, No____, Uncertain_____

B. Does your school provide such compensation?

Yes____, No____, Uncertain_____

RESPONSE:

	Yes	No	Uncertain	
A.	53.8%	21.8%	24.4%	(3 teachers made no comment)
B.	7.6%	87.3%	5.1%	(2 teachers made no comment)

INTERPRETATION:

The greatest percentage of teachers believe that teachers should receive monetary compensation for their roles in science competition. One teacher stated that if the additional help were given out of class time, compensation would be justified. Two teachers stated that their district provided extra pay for the director of the fair, and that part of their own expenses were paid.

QUESTION 16: Do you believe that more teachers would encourage student participation if they were paid?

Yes____, No____, Uncertain_____

RESPONSE:

Yes	No	Uncertain
55.7%	19.0%	25.3%

INTERPRETATION:

Over half of the teachers believe that more teachers would encourage competition if they were paid for their role in science competition.

QUESTION 17: Do you believe that more teachers would encourage student participation if they had release time to assist students?

Yes____, No____, Uncertain_____

RESPONSE:

Yes	No	Uncertain	
66.7%	7.7%	25.6%	(3 teachers made no comment)

QUESTION 18: Do you plan to encourage student participation in the future?

Yes____, No____, Uncertain_____

RESPONSE:

Yes	No	Uncertain	
53.8%	11.0%	32.1%	(3 teachers made no comment)

QUESTION 19: A. Will your school district pay student expenses to science fairs?

Yes____, No____, Uncertain_____

B. If no, how are or should these expenses be provided?

Parents___,Teachers___,Community sponsors___,Other__

RESPONSE:

	Yes	No	Uncertain	
A.	40.8%	22.4%	36.8%	(5 teachers made no comment)

B. Of the 22.4% who responded no to the question, 100% said that parents provide the expenses Seventeen point six percent stated that parents and teachers share the expenses; 47% said that community sponsors support the activity, and 11.8% stated that fund-raising activities were used; 5.9% said that Indian funds were used to defray expenses.

INTERPRETATION:

Forty point eight percent of the school districts will pay student expenses to science fairs. When they do not, parents most often provide the support; teachers, community sponsors, fund-raising activities, and Indian funds may also be used.

THE ORDER OF THE POSSIBLE RESPONSES TO QUESTION NUMBERS 20-30 WILL BE FOUND IN THE QUESTIONNAIRE LOCATED IN THE APPENDIX OF THIS PAPER. THE ANSWERS THAT FOLLOW BELOW ARE ARRANGED IN THE ORDER OF THE GREATEST TO THE LEAST NUMBER OF TEACHERS SELECTING THEM. PARENTHETICAL NUMBERS (58) INDICATE THE NUMBER OF TEACHERS (out of the 81 respondents) WHO SELECTED THAT STATEMENT AS AT LEAST ON OF THEIR RESPONSES.

QUESTION 20: What criticism do you have toward science competition?

RESPONSE:

1. (58) Teachers do not have the time to devote to the activity.
2. (43) Parents or teachers do most of the work.
3. (42) Students must be frequently "prodded" to complete their projects.
4. (41) Students are not really interested.

5. (38) Students have too much difficulty choosing a topic.
6. (36) Students are forced into competition as an assignment and therefore learn to dislike the activity.
7. (34) There is too much emphasis on the display aspects of competition and not enough on the process of scientific inquiry.
8. (32) Teachers are hesitant to encourage student participation because of lack of knowledge about the activity.
9. (28) Parents do not encourage their children; more home cooperation is needed.
10. (27) Students are seldom able to work independently and carry their project to a conclusion.
11. (20) Only the above "average" student will complete a project.
12. (17) Cooperation, in science, not competition, should be encouraged.

13-14-15. (14) Teachers become too competitive to produce winners.

13-14-15. (14) Judges are not well qualified.

16. (11) Original work is impossible.
17. (10) School district and/or administration do not support this type of activity.
18. (8) Awards are not adequate.
19. (6) Competition hinders interaction among children who are working on different projects.
20. (4) There is pressure from the school to sponsor students.

INTERPRETATION:

The main criticism that teachers have toward science competition is that they themselves do not have the time to devote to the activity. Seventy-one point six percent of the teachers cite this as a criticism. The criticism that parents or teachers do most of the work is cited by 53.1%. The criticism that students must be "prodded" to

complete their projects and that the students are not really interested is also seen as a major criticism of science competition. Forty-two percent saw the emphasis on display as a criticism. It appears that few teachers (4.9%) feel that there is pressure from the school to sponsor students.

Teachers mentioned other criticisms. One teacher admitted that he is not enthusiastic enough about fairs to encourage them; another stated that apathy was apparent on the part of students and teachers after being involved for a few years; another mentioned that the administration discouraged competition and that he felt this was unfortunate; another teacher said that fairs were too expensive to attend and that very few of the projects were done in the teacher's major interest area and that consequently, the teacher found it difficult to assist students. One teacher said that in some fairs, students had purchased ready made science kits and were allowed to compete on the same level as original projects, and the fact that this was allowed was discouraging for the student who had a lack of money. Several teachers stated that it was difficult to get judges because they often cannot take time off from work to assist. A lack of equipment, lack of student interest, and a lack of teacher time was most frequently mentioned as additional criticisms of science competition.

QUESTION 21: What do you feel are the values of science competition?

RESPONSE:

1. (57) Students have the opportunity to use scientific method.
2. (55) The activity allows for individualization; students learn independently of a formal classroom.
3. (45) Students gain a strong sense of achievement and a more positive self-concept.
4. (43) Students develop creativity.
5. (42) The activity encourages students along science related careers.
6. (39) Students are exposed to the knowledge of scientific literature.
7. (38) Students learn to solve problems by logical methods.
8. (37) Students learn to accept failure as well as success.
9. (36) Students develop analytical and critical thinking skills.
10. (28) Students are evaluated and constructively criticized by judges.
11. (27) Students learn how the content of science is generated.

12-13. (26) The content of science is generated.

12-13. (26) The average and even poor students have a more equal chance of success.

14-15. (18) Teachers gain a sense of satisfaction.

14-15. (18) Students are led into the community.

INTERPRETATION:

That students have the opportunity to use scientific method is seen by 70.4% of the teachers as a major value. The facts that the activity allows for individualization, that students gain a sense of achievement and a more positive self-concept, and that they develop creativity are also placed high on the value list. That competition

encourages students along science-related careers is highly rated as well as their exposure to scientific knowledge. That students learn to accept failure as well as success and that they develop analytical and critical thinking skills is also of value to at least 44.4% of the teachers.

QUESTION 22: Who do you believe is the primary positive influence for students who do enter science competition?

Teachers____, Parents____, School administration___, Community___, Sponsors of competition___ Students themselves___, Other_____

RESPONSE:

48.8% Teachers
17.5% Students themselves
10.0% Teachers and Students
7.5% Teachers, Parents, and Students
3.8% Teachers and Parents
2.5% Parents
2.5% The influence varies
1.3% Teachers and School Administration
6.3% Parents and Students
1 teacher had no comment

INTERPRETATION:

The greatest percentage of teachers (48.8%) believe that teachers are the primary positive influence for students who do enter science competition. The next greatest percentage of teachers (17.5%) believe that the students themselves are the primary positive influence.

QUESTION 23: What should be the role of the teacher who has students involved in this activity?

RESPONSE:

1. (63) To inform students about science competition.
2. (62) To act as a resource person.
3. (44) To provide challenges for students to learn scientific method.

4-5. (43) To proof-read and help to refine the project.

4-5. (43) To help with ideas for the display.

6. (37) To teach the format for the written report.
7. (22) To serve as judges.
8. (11) To find community volunteers to assist with project.
9. (8) To assist in making the display.
10. (1) To be actively involved in preparing the display and the report.

INTERPRETATION:

Seventy-seven point eight percent of the teachers believe that the role of the teacher should be to inform students about science competition and to act as a resource person. Fifty-four point three percent of the teachers believe that the teacher should provide challenges for students to learn scientific method, to proof-read, help refine the project, and help with ideas for the display.

QUESTION 24: What should be the role of the parents whose children are involved in science competition?

RESPONSE:

1. (60) To provide encouragement only from the "sidelines."
2. (47) To help proof-read and refine the project.

3-4. (13) To assist in project construction.

3-4. (13) To be an active participant with the child; to help with the report and the display.

5. (12) To serve as judges.

INTERPRETATION:

Seventy-four point one percent of the teachers believe that the role of parents should be to provide encouragement only from the "sidelines." Fifty-eight percent of teachers believe that parents should also help proof-read and refine the project, and 16% believe that parents should assist in project construction and be an active participant with the child, helping with the report and the display. Only 14.8% believe that parents should serve as judges.

QUESTION 25: What should be the role of the community?

RESPONSE:

1. (70) To serve as resource people.
2. (46) To provide monetary support for student travel and expenses at competition sites.
3. (35) To serve as judges.
4. (2) To actively assist with the project and written reports.

INTERPRETATION:

Eighty-six point four percent of the teachers believe that the role of the community should be to serve as resource people. Fifty-six point eight percent also believe that the community should provide

monetary support for student travel and expenses at the competition sites.

QUESTION 26: How do you feel about judging of student entries?

RESPONSE:

1. (30) The judging is accurately done and is unbiased.
2. (25) I have not had the opportunity to observe.
3. (22) There is too much emphasis on the display.
4. (11) The judging is inaccurate and biased.

INTERPRETATION:

Thirty-seven percent of the teachers feel that the judging is accurately done and is unbiased. Thirty point nine percent have not had the opportunity to observe, and 27.2% feel that there is too much emphasis on the display. Thirteen point six percent feel that the judging is inaccurate and biased.

QUESTION 27: How should the judges be chosen?

RESPONSE:

1. (47) Scientists and the community should be equally represented.
2. (29) Teachers may be judges but only if their students are not competing.
3. (22) Judges should only be chosen from the "scientific community."
4. (0) Judges should be chosen from laypersons rather than from the scientists.

INTERPRETATION:

Fifty-eight percent of the teachers feel that the judges should be chosen from scientists and the community with equal representation. Thirty-five point eight percent of the teachers feel that teachers may be judges but only if their students are not competing. Twenty-seven point two percent feel that judges should be chosen only from the "scientific community."

QUESTION 28: How do you involve students in developing projects suitable for science competition?

RESPONSE:

1. (38) Only students interested in the activity are encouraged to take part; they choose their own activity.
2. (26) I have not had students in this type of activity.
3. (21) Each student in class is assigned a project of his own choosing.
4. (9) Parents are informed about the activity and are asked to encourage their children.
5. (5) Each student in class is assigned a project, the topic of which is chosen from a list prepared by the teacher.

INTERPRETATION:

Forty-six point nine percent of the teachers encourage only those students who are interested in the project. Thirty-two point one percent of the teachers had not had students in this type of activity. Twenty-five point nine percent of the teachers assign each student in class a project of his own choosing. Eleven point one

percent inform parents about the activity and ask them to encourage their children. One teacher mentioned that an "A" grade was given to those students who did complete a project suitable for science competition. Many teachers stated that they believed that projects should not be required, but that all students should be encouraged to take part.

QUESTION 29: At what age to you believe a child's peak interest in science is reached?

Under 6___, 7-10___, 11-13___, 14-17___, 18-21___,

Other_____

RESPONSE:

2.7% UNDER 6

6.8% 7-10

37.8% 11-13

33.8% 14-17

6.8% 18-21

12.2% OTHER (1 teacher said 12-14; and 8 said that the age varies with the individual

7 teachers did not comment

INTERPRETATION:

Seventy-one point six percent of the teachers believe that the child's peak interest in science occurs between the ages of 11-17.

QUESTION 30: Please state any other factors that you feel contribute to student participation or non-participation in science competition.

RESPONSE:

In Class III schools, a frequent comment was the fact that when a teacher has four or five different areas of study for which to prepare, there is not enough time for that teacher to assist in project development. A lack of equipment, research materials, and space for projects was also mentioned as a factor in non-participation.

One teacher felt that the time spent on a project could not be justified as far as preparation for the future and that it was difficult to cover required material without having to spend time on projects.

The factor of student time was stressed by some teachers. The fact that many students in rural areas are needed at home and consequently cannot spend time after school on project work was mentioned as a factor in non-participation.

In Class II schools many teachers commented about the apathy of today's students saying that, "Many young people today do not like to work on their own; they are not properly motivated or are just plain lazy."

The idea that junior high is where a science foundation is built and that competition should come later in high school was also mentioned; then too, a special class during which a project could be developed and taken for a semester was suggested for high school level.

The work load imposed on the teacher was a frequent comment; it is felt by many teachers that the amount of time needed to properly guide students is extemely great. The advance planning that the teacher must do was also mentioned as a time-consuming feature of science competition.

A lack of confidence, equipment, and ideas on the part of teachers and students was cited as a factor in competition.

One teacher stated that, "Our school has so many other options that only a very few students find science fairs more interesting than other activities." Another said that, "Most of the better students are too busy with other school activities."

One teacher related a story about a teacher who approached the science fair projects in two different ways. One year his science students were required to do projects; 10% of them went through the district fairs and on to the state fair; he was a "hero" in the community, but the majority of his students hated him. The next year he approached the fair strictly as a voluntary assignment; one student went to divisional and didn't make it to the state fair; the community was upset because he "wasn't doing his job," but his students all loved him.

In the Class I schools it was mentioned that apathy on the part of students might be related to having done too much project work in elementary school. The lack of interest shown by students and the idea

that current society does not foster an attitude of being an individual --a necessary part of science competition was mentioned as a factor in non-participation. The extra-curricular activites now available to students were felt to lead students away from science fair projects which are "work" and into other school activities which are "fun."

The awards received at fairs were mentioned as not creating much of an incentive for competition.

The Montana High School Association's action in eliminating grades 7 and 8 from science fairs in any area except local (in this particular district) was believed to be instrumental in "killing" science fair interest and was mentioned as a factor in non-participation.

The most important factor in competition to many teachers was the willingness of the teacher to help and encourage student competition. It was frequently stated that <u>pressure</u> should not be placed upon students to do projects. Science interest must be natural and sincere and will most certainly be discouraged if it is forced upon one as a required science project.

RESULTS OF DATA GATHERED FROM THE INVESTIGATION OF THE RECORDS OF THE ANACONDA COMPANY'S SCIENTIFIC ACHIEVEMENT PROGRAM

The following data was given to the researcher by Mr. Gail Anderson, director of the Anaconda Company's Scientific Achievement Program. The statistical hypotheses that were investigated are as follows:

HYPOTHESIS:

1. H_o - There were the same number of students entering the Anaconda Company's fair in 1974 as there had been during the four previous one year periods.

H_1 - There was a significant difference in the number of students entering the Anaconda Company's fair in 1974 when compared with the previous four year periods.

RESULT:

The question will not be handled statistically. It may be stated, however, that the following numbers of students entered the fair in the past five years:

1970 - 26
1971 - 27
1972 - 50
1973 - 30
1974 - 53

The number of participants indicates to the writer that during the past five years, there has been a continued interested in participation.

HYPOTHESIS:

2. H_o - There is no significant difference in the total number of boys who entered competition in the last five years when compared with the total number of girls who entered competition during the same time period.

H_1 - There is a significant difference in the number of boys who entered competition in the last five years when compared with the number of girls.

RESULT:

YEAR	GIRLS	BOYS
1970	8	18
1971	11	16
1972	26	24
1973	19	11
1974	28	25

TOTAL GIRLS 92
TOTAL BOYS 94

X	O	E	O-E	$(O-E)^2$	$\frac{(O-E^2)}{E}$	$X^2 = \frac{\varepsilon(O-E)^2}{E}$
Boys	94	93	+1	1	.01075	
Girls	92	93	-1	1	.01075	$X^2 = \varepsilon.01075+$
				TOTAL	.02150	.01075 = .0215

The critical value of X^2 at $\alpha = .05$, df = 1 is 3.84. Since the calculated value of X^2 was found to be .0215, the calculated value does not exceed the critical value, and the null hypothesis is retained at the .05 level of significance. The expected ratio of equal numbers of boys and girls has been assumed. There is no significant difference in the number of boys who have entered competition during the last five years when compared with the number of girls.

HYPOTHESIS:

3. H_o - When compared with the numbers of junior high school students of the Caucasoid race as listed in the 1970 Census of Population for Montana, there have equal numbers of minority races entering competition.

H_1 - When compared with numbers of junior high school students of the Caucasoid race in Montana, there is a significant difference in the numbers of minority races entering competition.

RESULT:

No information concerning race of participants is elicited in the application forms for the Anaconda Company's Program, so this information is not available.

HYPOTHESIS:

4. H_o - In the past five years there have been equal proportions of students in Class I, II, and III schools entering competition.

H_1 - In the past five years there has been a significant difference in the number of students from one class when compared with another.

RESULT:

Class	Number of Students in Past Five Years	Percentage in Fair	Percentage in the Stage
I	102	54.84	55.00
II	62	33.33	34.59
III	22	11.83	10.40

Class	O	E	O-E	$(O-E)^2$	$\frac{O-E^2}{E}$	$X^2 = \frac{\varepsilon(O-E)^2}{E}$
I	102	102.3	-.3	.09	.00087	
II	62	64.34	-2.34	5.48	.08517	$X^2 = \varepsilon.00087+$
III	22	19.34	+2.66	7.08	.36608	.08517 + .36608 = .45212
				TOTAL	.45212	

The critical value of X^2 at $\alpha = .05$, df = 2 is 5.99. The calculated value of X^2 was found to be .45. Since the calculated value does not exceed the critical value, the null hypothesis is retained. The observed proportions of students from Class I, II, and III that participated in the Anaconda Company's Scientific Achievement Program

does not differ significantly from the expected proportions which are based on the actual proportions of students in Class I, II, and III Montana schools.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to identify factors, as seen by Montana junior high school science teachers and identified by the researcher, which contribute to student participation or nonparticipation in Montana science competition.

A questionnaire to determine these factors was designed and mailed to one hundred Class I, II, and III grade 7, 8, and 9 teachers who had a minimum of two years of teaching experience. The various geographic areas of the state were appropriately represented. Eighty-one percent of the questionnaires were returned. The writer believes that this response is representative of Montana junior high school science teachers.

A review of literature related to science competition was conducted by the researcher.

A description was given concerning the procedure which would be used to collect, organize, and analyze the data obtained by the teacher survey.

The findings and interpretations of the data were presented in list and discussion form.

Conclusions

The analysis of data obtained by the survey indicates teacher attitudes concerning items presented to them.

The results of the survey presented positive and negative attitudes toward the various aspects of science competition.

The researcher has drawn the following conclusions concerning teacher attitudes toward Montana junior high science competition in Montana.

The majority of science teachers teach more than one grade level of science and five to six classes of science per day; in addition, they teach other academic areas and assist with sports and extra-curricular activities. Over 50% of them assist with physical education activities, and over 8% assist with science-related activities. Teachers of Class I schools teach larger class sizes, but 75% of them teach only one grade level of science. In Class II schools 32.1% teach one grade level and teach slightly smaller classes than in Class I. In Class III schools only 4% teach one grade level, but they have an average of 7.8 fewer students per class than teachers in Classes I and II. Teachers in Class III teach many other classes in addition to their science classes when compared with Class I and II teachers.

The average number of years of teaching experience was found to be 8.5 years with Class I teachers having slightly more experience than

II and Class II having slightly more experience than Class III. Over 90% of the teachers teach in traditional physical school buildings. Over 80% of them assist with church, community, or extra-curricular school activities.

The methodology of science teachers was found to be a lab-lecture situation with a ratio of approximately 2 lab periods to 3 lecture periods.

It was not possible to determine if the male/female ratio of the survey's respondents were representative of the state male/female junior high science teacher ratio. Sixteen percent of the respondents were female. Eighty-four percent of the respondents were male.

It was found that more Class III teachers had had students enter competition than Class I or II, but overall 49.4% of the teachers had had students enter competition and 50.6% had not. The majority of the teachers had been made aware of competition by letter, although 28% of those in Class III schools stated that they had never been informed of any competition possibilities. Twenty-five percent in Class II and 14.3% in Class I stated no information concerning any Montana science competition had been received by them.

As students, 37% of the teachers had been involved in science competition, and over half of them expressed positive feelings toward their experience; reservations were expressed about the amount of parental or teacher help necessary for successful projects. Those who

expressed negative feelings believed that competition was often between the teachers and parents rather than the students.

Overall, 51.9% of the teachers felt that it is important to encourage student participation in science competition, 32.1% were uncertain, and 16% feld that encouragement was not important.

The belief that teacher education programs should include training in guiding science competition was stated by 60% of the teachers, and 78.5% said that their own education did not provide such training.

Over 60% of the teachers believed that teachers may willfully withhold competition information from students because they are not interested or do not have the time to devote to the activity.

The majority of teachers believe that teachers should receive monetary compensation for their roles in science competition and that more teachers would encourage participation if they were paid and/or had release time with which to assist students.

Over half of the teachers plan to encourage science competition in the future.

Expenses for the students involved in competition are generally provided by parents, but 40.8% of the school districts do assist with expenses. Teachers, community sponsors, and special funds are also used to help defray expenses.

The main criticism that teachers have toward science competition is that they themselves do not have the time to devote to this time-consuming activity. It appears to the researcher that in view of class assignments, class sizes, and extra community and school activities in which teachers engage, this is an easily understood criticism.

The criticism that teachers or parents do most of the work was cited by 53.1%. Data supporting or rejecting this criticism was not elicited by the researcher, but would be an interesting topic for a further study. Apathy on the part of students and the fact that students must be prodded to complete their projects was also high on the list of criticisms. Forty-two percent of the teachers see the emphasis on the display aspects of competition rather than on the actual scientific inquiry as a major criticism. Forcing students into competition and thus causing them to dislike science or the activity itself was also a major concern. Overall, the lack of teacher time, equipment, and student apathy were most frequently stressed criticisms of science competition.

That students have the opportunity to use scientific method was seen by 70.4% of the teachers as a major value. The facts that the activity allows for individualization, that students gain a sense of achievement and a more positive self-concept, and that they develop creativity are also placed high on the value list. That competition encourages students along science related careers was highly rated as

well as their exposure to scientific knowledge. That students learn to accept failure as well as success and they they develop analytical and critical thinking skills was also seen to be of value to at least 44.4% of the teachers.

The majority of teachers believe that teachers are the primary positive influence for students who do enter competition, and 17.5% believe that the students themselves are the primary positive influence.

Teachers believe that their role should be to inform students about competition and to act as resource people. They also feel that the teacher should provide challenges for students to learn scientific method, should proof-read, should help refine projects, and should help with ideas for the display.

Seventy-four point one percent believe that the role of parents should be to provide encouragement only from the sidelines. Fifty-eight percent believe that parents should help proof-read and refine the project, and 16% believe that parents should assist in project construction and be an active participant with the child. Only 14.8% believe that parents should serve as judges.

Teachers believe that the role of the community should be to serve as resource people, and over half of them feel that the community should provide monetary support for student travel and expenses at competition sites.

Thirty-seven percent feel that the judging is accurately done and unbiased. Thirty point nine percent have not had the opportunity to observe, and 27.2% feel that there is too much emphasis on the display during the judging. Thirteen point six percent feel that judging is inaccurate and biased.

Fifty-eight percent feel that the judges should be chosen from scientists and the community with equal representation. Thirty-five point eight percent feel that teachers should be judges only if their students are not competing, and 27.2% feel that judges should only be chosen from the "scientific community."

The majority of teachers encourages only those students who are interested in the science project, but 35.9% do assign each student in class a project of the student's own choosing. Eleven point one percent inform parents about the activity and ask them to encourage their children.

Seventy-one point six percent of the teachers believe that the child's peak interest in science occurs between the ages of 11-17. Moore (1962, p. 178) stresses the importance of the junior high school years in encouraging the development of young scientists and states that data compiled from finalists in international fairs indicates that from a total of 2,041 students (over a period of 13 years), the 12 year old (grade 7) age is a time at which a peak interest in science is achieved.

The investigation of the Anaconda Company's Scientific Achievement Program indicates to the researcher that student participation in their competition is continuing, that boys and girls are equally represented as participants, and that representative proportions of Class I, II, and III school districts take part.

The demands put upon today's teachers are indeed great. Apathy on the part of students is a frequently voiced complaint by teachers as well as parents. Some school districts will no doubt continue to have financial problems resulting in a lack of scientific equipment, space, and research materials. In spite of the many options offered to our youth, some will choose the scientific ones and become the scientists of the 21st Century.

The willingness of the teacher to help students cannot be underestimated. Science interest should be a natural thing enhancing the child's development. It can and should play a large part in the development of thought processes whether or not these thought processes are used in scientific endeavors.

The writer believes that because over 50% of those surveyed intend to encourage science competition, the activity will continue to be a popular one. Science competition obviously has important contributions to make to the education of our youth. The science fair, no doubt has faults but the correction of them is certainly no insurmountable.

School boards and administrators need to be made aware of the values of science competition; they need to be informed that the demands placed upon teachers by the classroom and the community sometimes causes these teachers to be reluctant to play an active role in the activity. Interested teachers, adminstrators, and parents should become catalysts for reducing teacher loads and gaining support for compensation with time and/or money for those teachers interested in challenging youth along investigative lines.

Recommendations

Based on the results of the survey, the writer believes that areas of concern have been depicted. Administration, school boards, and those in charge of competition should be made aware of the values of science competition and the difficulties associated with it. Particular attention should be given to items of criticism.

Teachers devoted to the philosophies of science competition need to act as catalysts in eliciting the support of teachers, school administration, school boards, parents and the community for the activity.

Because the greatest percentage of teachers are made aware of science competition by letters from those planning competition, it appears to the researcher that the names of all Montana science teachers should be available.

It is recommended that those in charge of competition strive to make teachers even more aware of competition possibilities. More publicity, especially to Class II and III schools is needed.

It is recommended that teacher education programs in college include more training in the philosophy of science competition and ways to involve and assist students.

The writer, at her local level, will strive to gain support for teachers and students who believe in the investigative process depicted in the activity of science competition.

APPENDICES

NORTH JUNIOR HIGH SCHOOL
2601 EIGHTH STREET NORTHEAST
GREAT FALLS, MONTANA 59404

April 19, 1975

PRINCIPAL—Robert K. McLeod
VICE PRINCIPAL—Gordon P. Dahl

761-5800
Ext. 361

Dear Principal:

I am writing this letter to solicit your assistance in determining the attitudes of Montana junior high school science teachers of grades 7,8, or 9 toward involvement in science competition. Reasons for interest and apathy on the part of teachers is not clearly understood by those who sponsor competition or by the teachers themselves. It is hoped that by using this questionnaire these attitudes may be identified, stated, and then used to affect necessary change, improvement, and better understanding among those involved.

Your school was among those randomly selected to obtain a representative picture. I request that you select a teacher at random from your faculty who has taught grade 7,8, or 9 science for at least two years to complete the questionnaire. (It has been found to take approximately 15 minutes to complete.) A stamped, addressed envelope is provided for return to me. A prompt reply will be appreciated. The name of the responding teacher is not required. Your school's class and zone are coded in the upper left hand corner of the questionnaire; this coded information will be used only to state group statistics. Individual school responses are confidential and will not be reported.

I will greatly appreciate your help in the professional spirit of education.

Sincerely,

Donna D. Aafedt
Science Department Head

NORTH JUNIOR HIGH SCHOOL
2601 EIGHTH STREET NORTHEAST
GREAT FALLS, MONTANA 59404

April 19, 1975

PRINCIPAL—Robert K. McLeod
VICE PRINCIPAL—Gordon P. Dahl

761-5800
Ext. 361

Dear Science Teacher:

I am writing this letter to solicit your assistance in determining the attitudes of Montana junior high school science teachers of grades 7, 8, or 9 toward involvement in science competition. Reasons for interest and apathy on the part of teachers is not clearly understood by those who sponsor competition or by the teachers themselves. It is hoped that by using this questionnaire these attitudes may be identified, stated, and then used to affect necessary improvement, change, and better understanding among those involved.

Your school was among those randomly selected to obtain a representative picture. If you have had two years of science teaching experience, I request that you answer the questionnaire. (It has been found to take approximately 15 minutes to complete.) If your science teaching experience is less than two years, I ask that you pass the questionnaire to a science teacher with two years experience who will be willing to complete it. A stamped, addressed envelope is provided for return to me. A prompt reply will be appreciated. The name of the responding teacher is not required. Your school's class and zone are coded in the upper left hand corner of the questionnaire; this coded information will be used only to state group statistics. Individual responses are confidential and will not be reported.

I will greatly appreciate your help in the professional spirit of education.

Sincerely,

Donna D. Aafedt
Science Department Head

Class:_____
Zone :_____

SCIENCE COMPETITION QUESTIONNAIRE

PLEASE ANSWER THE FOLLOWING QUESTIONS. ADDITIONAL COMMENTS ARE WELCOME.

1. What grade levels of science do you teach? 7 ____,8 ____,9 ____

2. How many classes of science do you teach per day? ____Total number of students?_____

3. What other subjects are you teaching this year? None____, Math____,PE____,
   Other _____
   (Explain)

4. How many years of teaching experience do you have? (Include this year) _____

5. How would you describe your school's physical facility? Open space_____,
   Traditional _____, Other _____

6. With what other school or community activities do you assist? Science club_____,
   Sports program_____ Other_____
   (Name sports)

7. How would you describe your method of teaching science? Lecture only _____, Lab-
   lecture_____, (List approximate percent of time devoted to each: Lab_____%,
   lecture _____%) Individualized continous progress_____, Other_____

8. Are you male or female? _____ How many grade 7, 8, or 9 female science teachers
   are employed in your school?_(Do not include yourself) How many grade 7, 8, or 9
   male science teachers are employed in your school?_____ (Do not include yourself)

   (This question will be used to ascertain if the sample taken represents the total
   state male/female science teacher ratio.)

SCIENCE COMPETITION IS DEFINED AS AN ACTIVITY IN WHICH STUDENTS DEVELOP AND CARRY TO A CONCLUSION A SCIENTIFIC EXPERIMENT, A LABORATORY METHOD, OR SOME PROCEDURE FOR INDUSTRIAL DEVELOPMENT. THE EFFORTS OF THE STUDENTS ARE THEN JUDGED AND DISPLAYS ARE EXHIBITED FOR PUBLIC VIEWING. THE COMPETITION MAY BE CONSIDERED AS LOCAL, STATE, OR NATIONAL.

9. Have any of your students (during the time that you had them in class) entered
   any type of science competition? _____ If yes, what type? Local____, State ____
   Industry sponsored_____, National_____.

10. How have you been made aware of competition possibilities? Letter _____, Newspaper_____,
    Magazines ____, Radio____, Other _____

11. Were you, as a student, ever involved in science competition? _____ If yes, please
    comment on the positive or negative aspects of your experience.
    _____

		Yes	No	Uncertain
12.	Do you feel that it is important to encourage student participation in science competition?	12____	_____	_____

		Yes	No	Uncertain
13.	Do you believe that teacher preparation programs in college should include training in the philosophy of science competition and ways to involve and assist students?	13. ____	____	____
	Did your teacher education program provide such training?	____	____	____
14.	Do you believe that some teachers may willfully withhold science competition information from students because the teachers themselves are not interested in the activity or do not have the time to devote to it?	14. ____	____	____
15.	Should teachers receive additional monetary compensation for sponsoring students in science competition? (Such as that received by coaches of sports)	15. ____	____	____
	Does your school provide such compensation?	____	____	____
16.	Do you believe that more teachers would encourage student participation if they were paid?	16. ____	____	____
17.	Do you believe that more teachers would encourage student participation if they had release time to assist students?	17. ____	____	____
18.	Do you plan to encourage student participation in the future?	18. ____	____	____
19.	Will your school district pay student expenses to science fairs?	19. ____	____	____

If no, how are (or would) these expenses be provided? Parents_____, Teachers_____, Community sponsors _____ Others _____ .

20. What criticisms do you have toward science competition? CHECK ALL THAT APPLY.

_____Teachers are hesitant to encourage student participation because of lack of knowledge about the activity.
_____Teachers do not have the time to devote to the activity.
_____Cooperation in science, not competition, should be encouraged.
_____Competition hinders interaction among children who are working on different projects.
_____Parents or teachers do most of the work.
_____Students are forced into competition as an assignment and therefore learn to dislike the activity.
_____Awards are not adequate.
_____Original work is impossible.
_____Teachers become too competitive to produce winners.
_____There is too much emphasis on the display aspects of competition and not enough on the process of scientific inquiry.
_____Judges are not well qualified.
_____Parents do not encourage their children; more home cooperation is needed.
_____Students are not really interested.
_____Students are seldom able to work independently and carry their project to a conclusion.
_____Students have too much difficulty choosing a topic.
_____Only the above "average" student will complete a project.
_____Students must be frequently "prodded" to complete their projects.
_____The value of the activity is minimal or negligible.
_____School district and/or administration do not support this type of activity.
_____There is pressure from the school to sponsor students.

Name other criticisms that you may have.

If you have never sponsored a student in science competition, please make a comment stating why you haven't.

21. What do you feel are the values of science competition?
_____The content of science is generated.
_____Students have the opportunity to use scientific method.
_____Students develop creativity.
_____Students are led into the community.
_____Students are exposed to the knowledge of scientific literature.
_____Students learn to accept failure as well as success.
_____Students develop analytical and critical thinking skills.
_____Teachers gain a sense of satisfaction.
_____Students learn how the content of science is generated.
_____Students are evaluated and constructively criticized by judges.
_____The activity encourages students along science-related careers.
_____Students learn to solve problems by logical methods.
_____The activity allows for individualization; students learn independently of a formal classroom.
_____ Students gain a strong sense of achievement and a more positive self-concept.
_____The average and even poor students have a more equal chance of success.

22. Who do you believe is the primary positive influence for students who do enter science competition? Teachers_____, Parents_____. School administration_____, Community _____, Sponsors of competition_____, Students themselves_____
Other _____

23. What should be the role of the teacher who has students involved in this activity?
_____To act as a resource person
_____To inform students about competition possibilities
_____To teach the format for the written report
_____To help with ideas for the display
_____To provide challenges for students to learn scientific method
_____To assist in making the display
_____To find community volunteers to assist with projects
_____To be actively involved in preparing the display and report
_____To serve as judges
_____To proof-read and help to refine the project
Other_____

24. What should be the role of the parents whose children are involved in science competition?
_____To assist in project construction
_____To provide encouragement only from the "side lines"
_____To be an active participant with the child; to help with the report and the display
_____To help proof-read and refine the project
_____To serve as judges

Other _____

25. What should be the role of the community?
_____To serve as resource people
_____To actively assist with the project and written reports
_____To provide monetary support for student travel and expenses at competition sites

_____To serve as judges
Other _____

26. How do you feel about the judging of student entries?
_____The judging is accurately done and is unbiased
_____The judging is inaccurate and biased
_____There is too much emphasis on the display
_____I have not had the opportunity to observe
Other _____

27. How should the judges be chosen?
_____Judges should be chosen from the community laypersons rather than from the scientist
_____Judges should only be chosen from the "scientific community".
_____Scientists and the community should be equally represented.
_____Teachers may be judges but only if their students are not competing.
Other _____

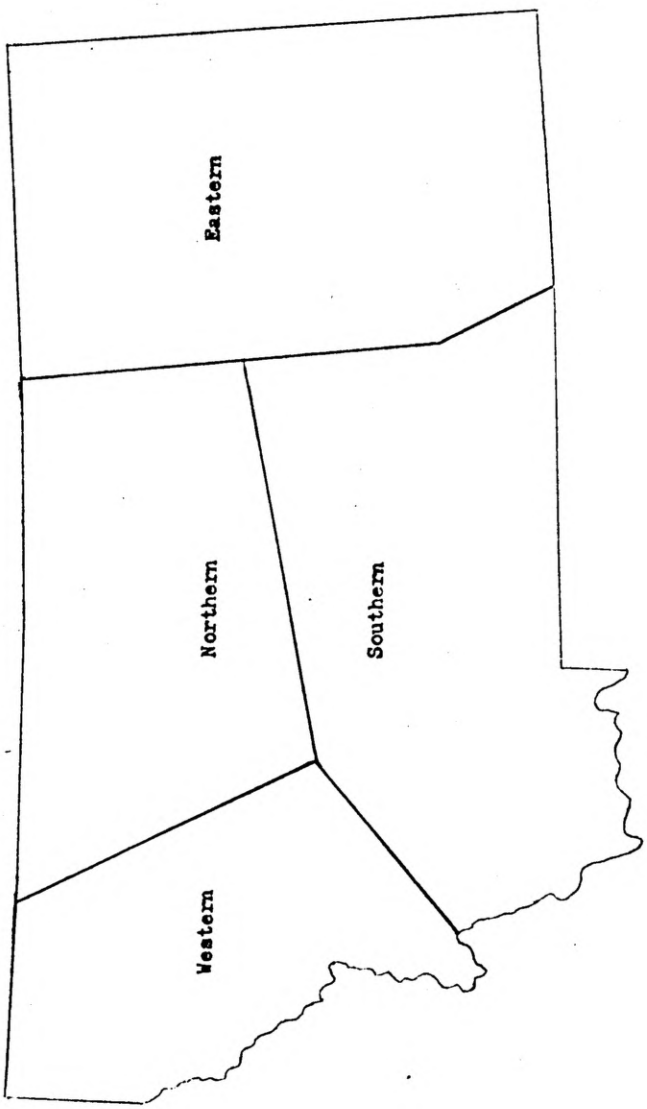
28. How do you involve students in developing projects suitable for science competition?
_____I have not had students in this type of activity.
_____Each student in class is assigned a project of his own choosing.
_____Each student in class is assigned a project, the topic of which is chosen from a list prepared by the teacher.
_____Only students interested in the activity are encouraged to take part; they choose their own activity .
_____Parents are informed about the activity and are asked to encouraged their children.

Comment _____

29. At what age do you believe a child's peak interest in science is reached?
Under 6_____, 7-10_____, 11-13_____, 14-17_____, 18-21_____, other_____

30. Please state any other factors that you feel contribute to student participation or non-participation in science competition.

MAP OF MONTANA GEOGRAPHIC DIVISIONS



REFERENCES CITED

Interviews

Anderson, Gail E. Telephone Interview, July 5, 1974.

Hess, Adrien L. Personal Interviews, July 2, 1974; July 9, 1974.

Collected Documents

Anaconda Company's Scientific Achievement Program. Science Entries, 1970-1974.

Other Sources

Anaconda Company Scholarship Scientific Achievement Program. Montana: Great Falls Reduction Department.

Consertino, Mary Jane. "Science Fairs," Science Activities, March/April, 1974, pp. 18-19.

Davis, Helen Miles. Exhibit Techniques. Washington: Science Service, 1951.

Eyster, Grace L. "Books, Libraries, and Science Fairs," Science Education, LIII,2, March, 1969, pp. 171-174.

Good, Carter V., Editor. Dictionary of Education. New York: McGraw-Hill Book Company, 1973.

Hess, Adrien L. Mathematics Projects Handbook. Boston: D.C. Heath and Company, 1962, pp. 1-3.

McElroy, William D. "Science, the Public, and the New Realities," Bioscience, Vol. 21, 1, January 1, 1971, pp. 59-61; 70.

Montana Education Directory. Montana: Superintendent of Public Instruction, 1973-1974.

Montana High School Association Official Handbook, 1973. Board of Directors, R. Rex Dalley, Executive Secretary, 1973-1974, p. 199.

Moore, Shirley. "Science Interest Peak at Age 12," Science Newsletter, Vol. 82, 11, September 15, 1962, p. 178.

Murphy, James E. "Science Fairs--A Favorable View," Science Activities, September, 1973, pp. 28-29.

Oppenheim, A.N. Questionnaire Design and Attitude Measurement. New York: Basic Books, Inc., 1966.

Paldy, Lester G. "Science Fairs--In the Spirit of Science?" Physics Teacher, IX, 8, November, 1971, pp. 427-428.

Pittera, Frederick P. "Exhibitions and Fairs," Encyclopaedia Brittannica, Vol. 8, 1971, pp. 956-958.

Science Clubs of America Sponsor Handbook. Washington, D.C.: Science Service, 1963-64.

Shaw, Marvin E. and Wright, Jack M. Scales for the Measurement of Attitudes. New York: McGraw-Hill Book Company, 1967.

Simmons, Maitland P. "Let's Join the Science Fair Winners," The Science Teacher, XXIV,5, September, 1957, pp. 225-227.

Starr, Robert J. "Developing the Expertise for Sponsoring Student Projects," The Science Teacher, XXXIX, 8, November, 1972, pp. 39-40.

Strassenburg, A.A. "Scientific Talent--What is Being Done to Preserve It?" Journal of College Teaching, Vol. 1, 2, December, 1971, pp. 9-11.