Name: Robert William Brannberg Date of Degree: May 26, 1957

Institution: Oklahoma A. and M. College Location: Stillwater, Oklahoma

Title of Study: HOW CAN AUDIO-VISUAL AIDS BE USED TO ADVANTAGE IN THE TEACHING OF PLANE GEOMETRY

Pages of Study: 27 Candidate for Degree of Master of Science

Major Field: Natural Science

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Findings and Conclusions: There are many excellent methods and techniques available for the teacher of plane geometry. The ease of presentation, adaptability, and financial cost of the filmstrip probably make it the most practical and useful of all the audio-visual materials. The opaque projector is a very versatile piece of equipment and can be used to great advantage in the classroom, particularly in showing teacher-made materials. The motion picture can best be used as an aid in teaching units where motion is inherent for pupil understanding. Films may also be used to stimulate pupil interest. Models are most useful in motivating thinking. A model on a display, available for pupil investigation will do much to clarify the meaning of the theorem it portrays.

ADVISER'S APPROVAL ______________________

HOW CAN AUDIO-VISUAL AIDS BE USED TO ADVANTAGE IN THE TEACHING OF PLANE GEOMETRY

By

ROBERT WILLIAM BRANNBERG

Bachelor of Science

University of Denver

Denver, Colorado

1951

Submitted to the faculty of the Graduate School of
the Oklahoma Agricultural and Mechanical College
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
May, 1957

HOW CAN AUDIO-VISUAL AIDS BE USED TO ADVANTAGE IN

THE TEACHING OF PLANE GEOMETRY

Report Approved:

Thesis Advisor

Dean of the Graduate School

ACKNOWLEDGEMENTS

The writer wishes to express his sincere appreciation and gratitude to Dr. James H. Zant, Professor of Mathematics, who read the manuscript of this edition and gave a number of useful suggestions.

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CHAPTER I

INTRODUCTION

The purpose of this report is to acquaint teachers, or prospective teachers of plane geometry with the audio-visual materials that are now available.

In the past the use of audio-visual materials has been well accepted in the teaching of solid geometry, but has not been well taken in the teaching of plane geometry. Most teachers of the latter have felt that their own methods of teaching are quite adequate, and have not taken the time to explore the possibilities of audio-visual materials. Many have thought that a sound motion picture is satisfactory for the social sciences, but entirely out of place in the more exacting sciences. There are some who have seen the need for a felt board (flannelograph) in teaching kindergarten, but say it is not suited for the secondary school. Other more liberal teachers have given audio-visual materials "a try" only to substantiate their own opinions that they "are not worth the time or effort".

The intent of this report is merely to inform the reader, and then it is his choice to decide whether or not he can incorporate the use of audio-visual materials into his methods of teaching plane geometry.

CHAPTER II

THE OPAQUE PROJECTOR

Potentially, one of the most useful types of still projection for instructional purposes, is the opaque projector. It permits non-transparent materials such as flat pictures, book illustrations, flat card drawings, and student's work to be shown on a screen for group observation.

The geometry teacher, with access to an opaque projector, has available an almost unlimited amount of illustrative material at little or no cost. These materials to be projected need not be photographed or put on slides; they can be projected directly from the textbook or from teacher-made material. The teacher may draw on cards certain figures, or originals that are not included in the textbook that is used. On some cards the theorem might be stated, and the students are asked to apply the hypothesis and conclusion to the lettered figure on the screen, and then find a way to prove the theorem. On other cards the applied hypothesis and conclusion are given; on still others only the hypothesis is given and the class is asked to discover what conclusions, if any, can be drawn and proved.

The use of home-made materials in the opaque projector has a tendency to do the following:

1. Stimulate attention
2. Arouse interest
3. Clarify information
4. Help students retain knowledge for a longer length of time.

5. Introduce new subjects or topics.

6. Present specific information.

7. Test knowledge and ability.

8. Review instructional problems.

9. Facilitate cooperative student-teacher participation in problem solving.[1]

The utilization of the opaque projector has been very well covered in this statement. "If there is a limit to suggestions for uses for the opaque projector, it is the limit of the imagination and versatility of the teacher."[2]

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1. K. B. Haas and H. Q. Packer, Preparation and Use of Audio-Visual Aids. New York: Prentice-Hall Book Company, Inc., 1955, p.73.

2. C. K. Miller, "Reviewing A Semester of Opaque Projection", The Educational Locus, Vol. 19, (1948), p.20.

CHAPTER III

FELT BOARDS

The felt board is a stationary or portable surface covered with a rough flannel, felt, suede or other material to which a similar material will adhere.

The technique of the felt board has become more important in recent years. It no longer is the small green felt board on which the teacher places "cut outs" such as pictures, words, or numbers in the kindergarten and lower elementary grades. Today it has become a dynamic teaching tool, used by an increasing number of industrialists and educators.[3]

An outstanding feature of the felt board method of presentation is its flexiability. The presentation may be designed around any size board, depending upon the amount of material to be covered and the time allotted. New material for the felt board may be added at very little expense, and it is a device that students as well as teachers can use.

The learning situation will determine how the felt board is to be used. Both the characteristics of the group and the nature of the material to be covered will determine the specific techniques used by the instructor. However most felt board presentations will be based on the following four steps:

1. Preparation

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3. K. B. Haas and H. Q. Packer, Preparation and Use of Audio-Visual Aids. New York: Prentice-Hall Book Company, Inc., 1955, p.119.

2. Presentation

3. Application

4. Testing

In preparing the felt board presentation it is essential that you have well in mind each step that you wish to follow. It might be well to rehearse the major points that you wish to cover. Make sure that you have the necessary felt symbols arranged in the proper order and placed around the board or on a near-by table, so that they will be accessible with a minimum amount of movement.[4]

It is well to reserve some time so that the group can discuss points in the presentation and apply the information to their own problems. This is an important step. Each member of the group should be encouraged to solve their problem by applying the information presented in the lesson.

In order to evaluate the effectiveness of your presentation, you will find it advisable to check the understanding of the group. This you may do by giving a short written test, or by any other means you choose.

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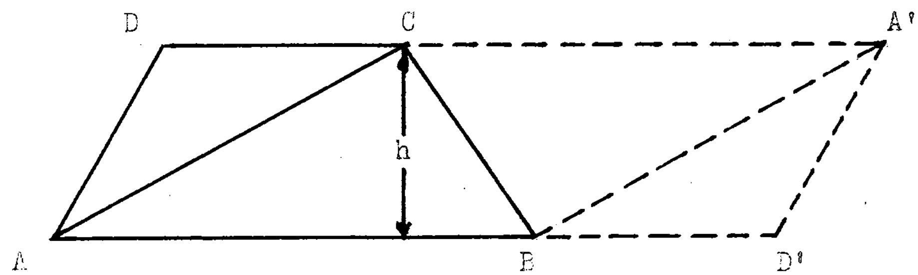
4. C. H. Dent and E. F. Tiemann, Felt Boards For Teaching, Visual Instruction Bureau, University of Texas, (1955).

FELT BOARD PRESENTATION SHOWING HOW THE FORMULA

FOR THE AREA OF A TRAPEZOID IS FOUND



MATERIALS

1. Four felt triangles preferably different colors.

2. Felt board.

EXPLANATION

You have given trapezoid ABCD and you are to prove that the area is equal to one half the height times the sum of the bases.

1. Lay down on the felt board trapezoid ABCD composed of triangles ADC and ABC.

2. Lay down triangle A'BC showing that triangle A'BC is congruent to triangle ABC.

3. Lay down triangle A'BD' showing that triangle A'BD' is congruent to triangle ADC.

4. ∴ Parallelogram AD'A'D is formed the area of which is $\frac{1}{2}$AD'h.

5. But AD' is equal to the sum of the bases of the original trapezoid.

6. ∴ Area of trapezoid ABCD equals $\frac{1}{2}$ h times the sum of the bases.

CONCLUSION

Particular attention should be called to the ways of proving the triangles congruent.

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ADVISER'S APPROVAL James H. Zant

FELT BOARD PRESENTATION SHOWING

PROPORTIONS IN RIGHT TRIANGLES

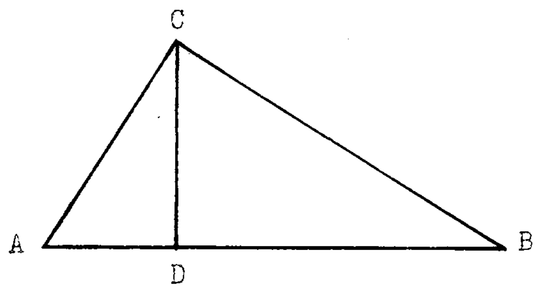

Figure 1

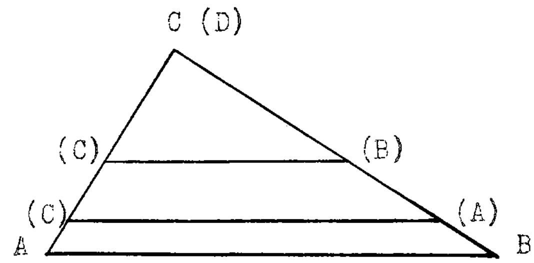

Figure 2

MATERIALS

1. Three felt triangles preferably different colors.
2. Felt demonstration board.

EXPLANATION

You have given right triangle ABC with the right angle at C, and CD perpendicular to AB. You might be asked to prove that the corresponding sides are in proportion, or to prove that the triangles are similar.

1. Lay down triangles ABC, ADC and BCD as shown in Figure 1.
2. Remove triangles ADC and BCD from the position of Figure 1. and place them as shown in Figure 2.

CONCLUSION

With the triangles in the position shown in Figure 2, it can be shown more easily how proportions are formed and that all three triangles are similar to each other and to the original triangle.

CHAPTER IV

MODELS

The use of models in the teaching of solid geometry has long been accepted, but in plane geometry they have had very little use. Many of the basic elementary parts of plane geometry are difficult for the beginning student to understand, and a visual impression will very often clarify the meaning of a proposition or theorem.[5]

There are four ways in which models may be constructively incorporated into the methods of teaching plane geometry:

1. A model is something different, something dynamic that the teacher may use to explain concepts, axioms, postulates, theorems, etc. The use of models should be a supplement to verbal explanation, and a means by which the student may further clarify in his mind the meaning of the theorem.
2. The model when put in easily accessible places should serve as a review of the theorem for which it was intended everytime the student picks it up. If the theorem has not yet been explained, the model should serve to stimulate the student to further investigation.
3. The model should be used to convince the student of the truth of a theorem. In the deductive method of proof the "truth" of a theorem does not always enter the picture,

5. "Multi-Sensory Aids In the Teaching of Mathematics", The National Council of Teachers of Mathematics, 18th Yearbook, pp.253-65.

and a conclusion must be accepted. A working model will allow the student to prove to himself that the theorem really "works".

4. A fourth way is to incorporate into the curriculum a term project that would necessitate the construction of a "working" model of some theorem. This will promote original thinging and do much to motivate the student.[6]

It is generally agreed that one of the primary purposes of geometry is the teaching of deduction, but it is neither necessary or desirable to deduce every relationship that we study in the course. Teachers as a whole find that it is very difficult to cover the prescribed work in the alloted time. The use of models allows for acceleration of certain parts of the curriculum without a sacrifice of understanding.

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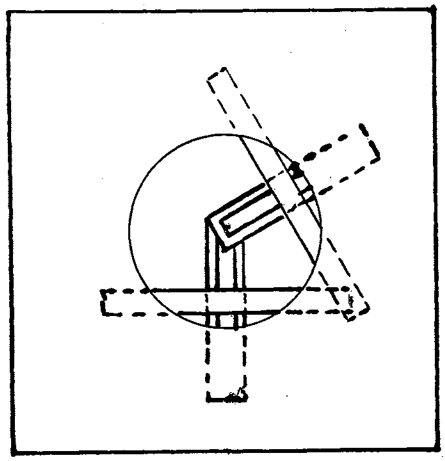
6. H. L. Smith, "Use of Models in the Teaching of Plane Geometry", Mathematics Teacher, Vol. 37, (1944), p.274.

MODEL FOR CIRCLES AND STRAIGHT LINES



MATERIALS

1. Two pieces stiff cardboard 15"x20", plus strips.
2. Glue, paper fasteners, pen and ink.

CONSTRUCTION

1. Cut out two cardboard rectangles 15"x20".
2. Draw a circle 12" in diameter in the center of one rectangle.
3. Divide circle into any convenient number of small equal arcs and make division marks on outside of circle.
4. Cut out circle and glue remainder of rectangle onto the other rectangle already cut out. You may bind the edges if you wish.
5. Cut out four cardboard strips. Two strips 3/4" wide and 14" long (chords), and two strips 1" wide and 7" long (radii).
6. Starting 1/2" from the inside end of the radius, cut a lengthwise slot 1/8" wide and 6 1/4" long through the center of each radius.
7. From point 0' 1/4" from same end of radius mark inches, half inches, and quarter inches outward along the edge of the slot.
8. Mark inches, half inches, and quarter inches on chords.

9. Attach a chord to each radius by a paper fastener through the center of the chord and slot in radius.

10. Slip ends of chords and radii to backboard by paper fastener through O' of each and through the center of the circular opening.

USES

A. For Pupil Examination

1. Place on a bulletin board for pupil investigation before the discussion of circles in class.

    a. Sliding chord on radius at right angles and tilted shows that only a radius perpendicular to a chord bisects chord, arc, and conversely.

    b. Sliding chord on radius shows corresponding change in major and monor arcs.

    c. Sliding both chords on their radii shows that equal chords have equal arcs, equal central angles, and are equidistant from the center.

    d. Removing ends of chords and radii from circular opening forms tangents and secants and shows their characteristics.

2. In class discussion encourage pupils to suggest relationships they have observed in the model.

B. It may be used by the teacher in helping to explain theorems concerning circles and straight lines.

C. The model may also be used with the unit on arcs and angles, by making chords and secants intersect inside, on and outside the circle.[7]

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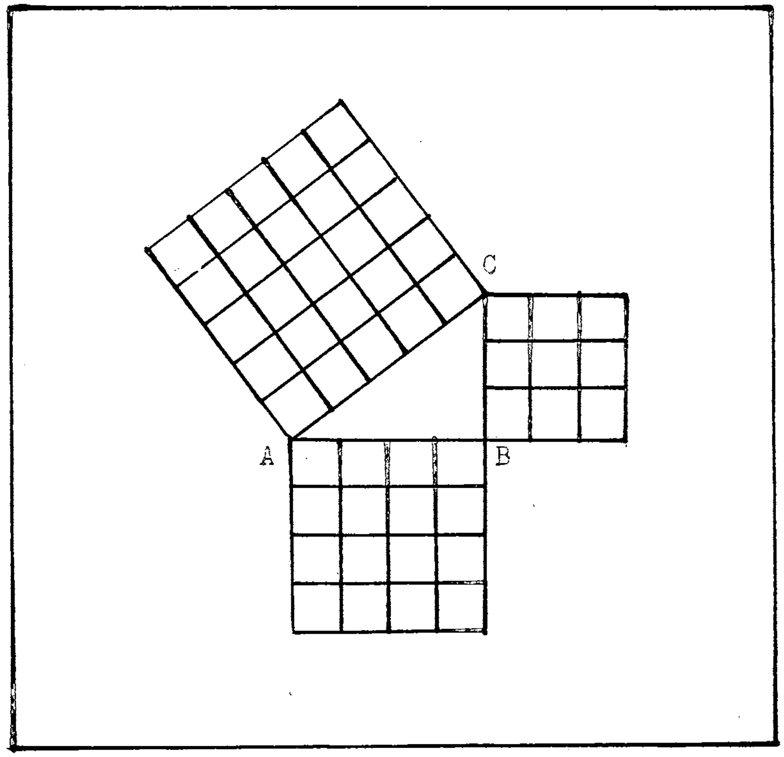
7. E. L. Grove, "Model for Circles and Straight Lines", School Science and Mathematics, Vol. 50, (1950), pp.743-4.

MODEL FOR THE PYTHAGOREAN THEOREM



MATERIALS

1. Two pieces $\frac{1}{4}$" plywood 18" wide and 24" long.
2. Sandpaper, shellac and brush.
3. Necessary tools.

CONSTRUCTION

1. Cut out figure as shown above from one piece of plywood.
2. Glue uncut piece to the piece cut in Step 1, so that a recess is formed.
3. Cut out triangle ABC so that it fits recess snugly. Glue in place.
4. Cut out and sand 25 squares that will just fit the square on side AD.

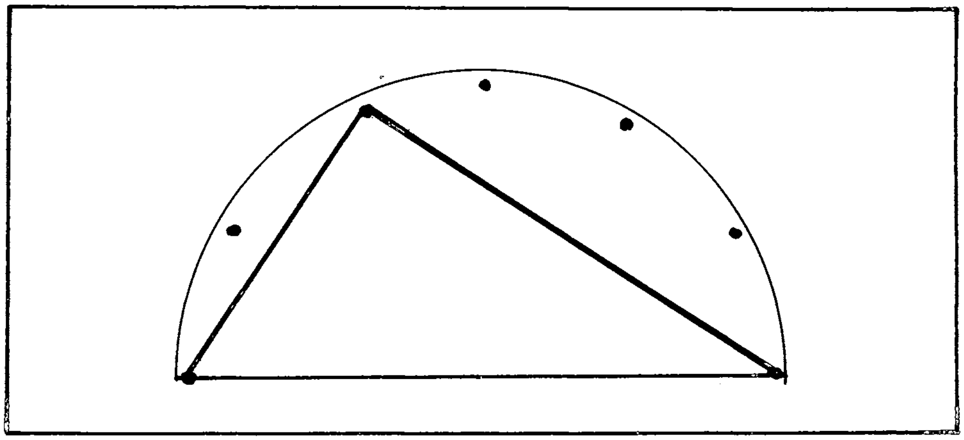
5. Sand, paint and finish as desired.

USES

1. This model is strong and can take abuse.
2. Place on a table in classroom and allow students to investigate. They will soon see that the 25 squares on side AC will exactly fit the other two sides.
3. This model is very useful for classroom demonstration in explaining the theorem.

MODEL FOR SHOWING THAT ANY ANGLE INSCRIBED

IN A SEMI-CIRCLE IS A RIGHT ANGLE



MATERIALS

1. One piece ¼" plywood 10" square.

2. One foot 1/8" wood doweling.

3. Necessary tools and finishing materials.

CONSTRUCTION

1. Cut or draw a semi-circle of desired radius.

2. Mount one inch dowels as shown in figure above.

3. Attach elastic band as shown in figure above.

USE

1. Place on a display table and allow students to experiment with it. They then will see that no matter which pin the elastic band is placed ove , there will be a right angle formed.

2. This model is very useful for classroom demonstration when presenting this theorem.

CHAPTER V

MOTION PICTURES

"One picture is worth 10,000 words" is a time honored statement that may or may not be entirely correct when applied to the field of plane geometry. The way in which a teacher approaches the showing of a motion picture has much to do with the success of it.

The following are the steps that should be observed in the presentation of a film:

1. Select proper films. It is unfair to the class to show a film just to take up time. Each film should have a definite teaching objective.
2. Preview the film. This must be done in order to insure the proper handling of the film. It is also advisable to make note of pertinent information as the film is previewed. This information should be emphasized as the film is shown.
3. Prepare the class for presentation. Identify in a clear-cut manner the problem that is to be solved by the film. Tell why you are showing the film, and above all, tell the student how he will benefit from it, and of what practical use it will be.
4. Show the film. As the film is being shown, point out the important parts that you noted while previewing the film. This is most important, and should help the student to concentrate on the film.
5. Apply instruction. Apply the information immediately to

specific problems. This allows the student to see the practical application. You may also ask students to explain in their own words various parts specifically mentioned in the film, insisting on correct terminology.

6. Test students. You should find out if the student can perform the tasks outlined in the film. You should find out if they can apply the new information, or use the new theorem. The test should be short and of an objective nature.

7. Review the lesson. This is the time that all weaknesses, errors, or misunderstandings revealed by the test should be corrected.[8]

The teacher might consider making a file of the films seen and used. A 3"x5" card for each film might contain a synopsis, together with the teacher's own evaluation, and comments for future use. Such cards, prepared by every teacher in the school who uses motion pictures, can subsequently be placed in a general school file where they can be indexed by title, and content. This pooling of experience can help avoid the use of inadequate films and promote the use of films that have proved satisfactory.[9]

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8. K. B. Haas and H. Q. Packer, <u>Preparation and Use of Audio-Visual Aids</u>. New York: Prentice-Hall Book Company, Inc., 1955, p.

9. Edgar Dale, <u>Audio-Visual Methods in Teaching</u>. New York: The Dryden Press, Inc., 1954, p.225.

CHAPTER VI

FILM STRIPS

The filmstrip is probably the most potent type of audio-visual aid that the teacher of plane geometry might use. It has one big advantage over the motion pictures in that each picture can be readily projected on the screen for any desired length of time. Students and teacher can then discuss the contents as exhaustively as may be required by the rate of learning desired.[10]

There are basically two types of filmstrips:

1. The discussional type which does not have any audio incorporated with it. It is a continous strip of film consisting of individual frames or pictures arranged in sequence, usually with explanatory titles. There are generally 25 pictures or more on one strip.
2. The sound filmstrip is the same as the discussional type except that explanations are given audibly by a record which is synchronized with the picture. A faint bell-like sound indicates when the next picture should be shown.

The question might be raised as to whether the filmstrip can or cannot do. Before selecting a filmstrip for use, the teacher might ask himself the following questions:

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10. K. B. Haas and H. Q. Packer, Preparation and Use of Audio-Visual Aids. New York: Prentice-Hall Book Company, Inc., 1955, p.27.

1. Is the purpose for which I wish to use this filmstrip one in which motion is inherently necessary for pupil understanding?

2. Does my teaching purpose involve a series of step by step developments, one leading to the next in logical sequence?

3. Are suitable filmstrips available for the particular teaching job that I have in mind?[11]

Tabler[12] found the filmstrip to be one of the fastest growing of all visual materials in use. He predicts that its use will expand ten times in the next decade.

Johnson[13] found in a study conducted that a combination of three motion pictures and three filmstrips definitely improved retention and ability to apply geometric principles.

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11. W. A. Wittich and C. F. Schuller, Audio-Visual Materials Their Nature and Use. New York: Harper and Brothers, Inc., 1953, p.324

12. C. H. Tabler, "The Next Decade of Audio-Visual Use", See and Hear, Vol. 3, (1947), p.18.

13. D. A. Johnson, "Are Films and Filmstrips Effective in Teaching Geometry", School Science and Mathematics, Vol. 50, (1950), p.572.

CHAPTER VII

SUGGESTED FILMS AND FILMSTRIPS

UNIT I. INTRODUCTION TO THE STUDY OF PLANE GEOMETRY

1. Geometry in Action. 10 min., LF,* '40

   Laws of geometry as applied to everyday living: in nature, in the home, at work, and at play.

2. Introduction To Plane Geometry. 42 frames, SVE '47.

   Initial frames enumerate occupations requiring geometry for success. Relationship between points, straight lines, curved lines, broken lines, a vertex, terminal side, initial side, and an angle.

3. Introduction To Plane Geometry. 43 frames, color, CUR.

   Defines geometry, point, line and plane. Measurements applying to straight lines and to plane figures; examples of each. Geometry as a study of plane figures, shape, size and relationship; examples, such as geometric figures, animals, similar clothing of various sizes. Importance of building of fundamentals. Validity of logical proof for use in chemistry, physics, aviation, etc.

4. Practical Geometry. 10 min., KB '45.

   Visualizing the mathematical applications of basic geometry. Erection of a perpendicular; relationship of the perpendicular to the ordinary plumb-bob, level and square.

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* For Key to Producers and Distributors, see p.26.

5. <u>Vocabulary--Lines and Relationships</u>. 23 frames, color, CUR.

Drawings and examples of oblique, horizontal and vertical lines; definition, examples, and uses of perpendicular lines. Shows how to drop a perpendicular from a point to a line.

6. <u>Lines and Angles</u>. 12 min., KB, '45.

The uses of geometry through the ages. Emphasis on angles---straight, right, acute, obtuse and reflex. Deliberate tempo of narration aids understanding. Recommended only for junior high school work.

7. <u>Angles</u>. 12 min., KB, '45.

Various types of angles and their relationships to each other.

8. <u>Basic Angles and Experimental Geometry</u>. 52 frames, SVE, '47.

Initial frames explain in diagrams, the meaning of a degree and the parts of an angle; angles classified according to size with differences between right, acute, straight, obtuse, and reflex angles.

9. <u>Postulates--Lines</u>. 56 frames, color, CUR.

Solving geometric problems compared with building a house; postulates as foundations of accepted statements; theorems as upright posts; proof as roof. Postulates concerning lines explained with everyday examples.

10. <u>Logic--Deductive Reasoning</u>. 24 frames, color, CUR.

Logic and bridge comparison. Deductive reasoning explained in terms of bridge--progression from what we know to what we want to know.

11. Introduction To Demonstrative Geometry--Axioms, Theorems and Postulates. 44 frames, SVE.

Original diagrams explain the axioms and postulates underlying demonstrative geometry. The two parts of a theorem; hypothesis and conclusion. Demonstration of proof of a single theorem, utilizing postulates and axioms as well as hypothesis of the theorem.

UNIT II. TRIANGLES

1. Vocabulary--Triangles. 39 frames, color, CUR.

Definition and composition of the triangle. Nomenclature and classification of sides and angles. Definition and examples of bases, medians, bisectors and altitudes. Facts concerning the three angle bisectors and the three altitudes of any triangle.

2. Congruent Figures. 12 min., KB.

Geometric principles of "equal sides and equal angles"; methods for finding and proving angles and sides equal.

3. Basic Triangles. 48 frames, SVE.

Strength and rigidity of the trangle, its practical applications. Classifications of triangles according to size of angles. Features and characteristics of right, obtuse, and equiangular triangles.

4. Congruent and Overlapping Triangles. 46 frames, SVE.

Diagrams and photographs illustrate congruent and overlapping triangles and where they are used.

UNIT III. PARALLEL AND PERPENDICULAR LINES

1. Vocabulary--Lines and Angles. Part 2. 50 frames, CUR.

The five types of angles defined with examples: adjacent, common-vertex, common side, complementary, supplementary, and vertical. Parallel lines defined with examples. Perpendiculars to parallel lines; transversals forming alternate exterior and interior angles; corresponding angles.

UNIT IV. POLYGONS

1. Vocabulary--Polygons. 56 frames, color, CUR.

Polygons defined. Examples of triangles; classifications by sides, and by angles. Sample problems. Equilateral, equiangular, and regular polygons; definitions and examples. Special quadrilaterals--names, characteristics, and "family tree", showing relationship.

2. Quadrilaterals. 54 frames, SVE, '48.

All members of the quadrilateral family; parallelogram, rhombus, square, rectangle, trapezoid, and isosceles trapezoid. Diagrams on similarities and differences among them.

3. Quadrilaterals. 12 min., KB, $46.

Chief properties of important quadrilaterals: parallelogram, rectangle, shombus, square, trapezoid, and trapezoidium.

UNIT V. AREAS OF POLYGONS

1. Areas. 12 min., KB, '45.

    Needs and uses for determining areas of various figures; graphis demonstration of recognized methods for computing areas of rectangles, parallelograms, triangles and circles.

2. Areas. 47 frames, SVE, '48.

    Meaning of areas; determining areas of triangles, parallelograms, squares and rectangles.

3. Pythagorean Theorem. 12 min., KB, '47.

    History of the theorem; detailed discussion of the use of the 3-4-5 triangle by the Egyptians. The theorem, proof, examples, and basic importance.

UNIT VI. CIRCLES, ANGLES AND ARCS

1. The Circle. 10 min., KB, '46.

    The problems presented by circles; radii, diameters, chords, tangents, secants, arcs, and central angles, defined and classified. Theorems and proofs.

2. Introduction To Circles. 48 frames, SVE, '42.

    Various lines related to the circle; where objects representing circles are used.

3. Vocabulary--Circles. Part 1. 35 frames, color, CUR.

    Merry-go round used to explain circles; circumference, center, radius and diameter. Definitions and examples of semi-circles, tangents, secants chords, point of tangence, arc-major and minor, and segments.

4. Vocabulary--Circles. Part 2. 23 frames, color, CUR.

Portions of pie explain central angles and sectors. Definitions and examples of inscribed angles, inscribed polygon, circumscribed polygon, and concentric circles.

5. Angles and Arcs in Circles. 10 min., KB, '46.

Measurement of central angles, arcs, inscribed angles and angles formed by two chords. Animated drawings demonstrate theorems and proofs.

6. Chords and Tangents of Circles. 10 min., KB, '45.

The circle-advanced phase. Theorem on a perpendicular to a chord within a circle; various types of tangents.

7. Common Tangents and Tangent Circles. 46 frames, SVE, '46.

Characteristics of common tangent circles; five different possibilities which exist between circles having common tangents.

UNIT VII. LOCI

1. Locus. 10 min., KB, '45.

Photographs, drawings and commentary on the meaning and application of loci.

2. Loci. 47 frames, SVE, '48.

Characteristics of loci; where found and where used. Common loci such as: circle, ellipse, parabola and perpendicular bisector.

3. Locus. 61 frames, color, CUR.

Definitions and everyday examples of loci. Examples of paths that are not loci. The five fundemental loci, applications of their use in designing a railroad, charting a course, etc. Importance of controlled movement in technical activity.

UNIT VIII. PROPORTIONS AND PROPORTIONAL SEGMENTS

1. Ratio and Proportion. 11 min., KB, '48.

Application of ratio in practical situations. Relationship between ratio and proportion. "product of the means equals the product of the extremes" theorem in detail. The usefulness of ratio for comparing quantities.

UNIT IX. SIMILAR POLYGONS

1. Similar Polygons. 44 frames, SVE, '48.

Characteristics of various similar polygons. Uses for similar polygons: maps, floor plans and surveying.

UNIT X. REGULAR POLYGONS AND CIRCLES

1. Polygons. 12 min., KB, '48.

Definition of polygon; concave and convex polygons clarified by animation. Inscribed circle and the circumscribed circle of a regular polygon.[14]

KEY TO PRODUCERS AND DISTRIBUTORS OF FILMS AND FILMSTRIPS

COR -- Coronet Instructional Films, Coronet Building, 65 E. South Water Street, Chicago 1, Illinois.

CUR -- Curriculum Films, 10 E. 40th St. New York 16, New York.

KB -- Knowledge Builders, Lowell and Cherry Lane, Floral Park, New York.

LF -- Library Films 25 W. 45th St., New York 19, New York.

SVE -- Society for Visual Education, 1345 W. Diversey Parkway, Chicago 14, Illinois.

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14. F. A. Krahn, Educational Film Guide and Filmstrip Guide. New York: H. W. Wilson Company, 1954.

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VITA

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Candidate for the Degree of

Master of Science

Report: HOW CAN AUDIO-VISUAL AIDS BE USED TO ADVANTAGE IN THE TEACHING OF PLANE GEOMETRY

Major Field: Mathematics

Biographical:

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