FILMS AND FILMSTRIPS FOR ALGEBRA

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I. THE PROBLEM

Introduction

There are many films and filmstrips available to teachers today which are being used in the secondary schools with increasing regularity. A study made by Tauber and Stephens compares the use of films and filmstrips in a sampling of secondary schools in three different years at five year intervals. They were concerned with the use of films and filmstrips in all classrooms.

They used three usage categories: much use, some use, and none, and found the per cent of schools who used films and filmstrips. The results of the study are shown in Table I.[1]

TABLE I

USAGE OF FILMS AND FILMSTRIPS

Year	1955-56	1960-61	1965-66
Category of use	Per cent	Per cent	Per cent
Much use	24	58	75
Some use	72	41	24
None	4	1	1

[1]Maurice F. Tauber and Irlene R. Stephens, "Conference on the Use of Printed and Audio-Visual Materials for Instructional Purposes." Final Report. Title VII Project B546, NDEA 1958, United States Department of Health, Education and Welfare, Office of Education, Columbia University, School of Library Services, New York.

There are many films and filmstrips available for use in the algebra classroom, however the writer was unable to find any studies pertaining to the number of schools using them or the extent of usage in algebra classes.

Many types of audio-visual aids are available for use in the algebra classroom, of these the chalkboard, film loop, filmstrip, and motion picture are among the most common. The chalkboard is probably still the most widely and consistently used. Film loops, which are segments of motion picture film in a continuous loop and placed in an inexpensive cartridge, are becoming extremely useful, even though they require a special projector.[1] Film loops and filmstrips are easy and simple to use, light in weight, and efficient enough to produce bright pictures in a room partially lighted, also the available repertoire is both vast and rapidly growing.[2] The audio-visual aids discussed in this report were filmstrips, usually 35 millimeter, with or without accompanying sound and 16 millimeter motion pictures.

Purposes of the Study

Since many films and filmstrips are available for use

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[1]J. McIntosh and P. Peak, "Materials of Instruction," National Association of Secondary School Principals Bulletin, LII (April, 1968), p. 163.

[2]Lester B. Sands, Audio-Visual Procedures in Teaching, (New York: The Ronald Press, 1956), p. 289-91.

by algebra instructors today, the purposes of this report were: (1) to acquaint algebra instructors with the advantages and disadvantages of using films and filmstrips as stated in the literature; (2) to determine from the literature efficient ways of using films and filmstrips; and (3) to acquaint teachers with worthwhile films and filmstrips which are available for use.

Delimitations

It was impossible and deemed undesirable to accumulate a complete list of films and filmstrips available for the teaching of algebra, so the writer delimited the study to those which have been evaluated in "The Mathematics Teacher" since January 1955. Only those films receiving satisfactory or better commentary were considered. Films which did not seem pertinent to algebra were not considered.

II. ADVANTAGES AND DISADVANTAGES OF USING FILMS AND FILMSTRIPS

Advantages

Many advantages for the use of audio-visual aids have been expressed in professional literature.

The researches of educational investigators confirm the findings of ordinary observation and common sense, to wit, that the human being learns more easily and faster by audio-visual processes than by (sic) verbal

explanation alone.[1]

Most of the advantages stated for audio-visual aids
can be applied to films and filmstrips and their uses in
the algebra classroom. Dale listed the following advantages:

When properly used: (1) They supply a concrete basis
for conceptual thinking and hence reduce meaningless
word-responses of students. (2) They have a high degree
of interest for students. (3) They make learning more
permanent. (4) They offer a reality of experience which
stimulates self-activity on the part of pupils. (5)
They develop a continuity of thought; this is especially
true of motion pictures. (6) They contribute to growth
of meaning and hence to vocabulary development. (7)
They provide experiences not easily obtained through
other materials and contribute to the efficiency, depth,
and variety of learning.[2]

They (films and filmstrips) increase learning because
learning is made pleasant because of them and pleasure in
itself has been proved to be an incentive to learning. They
increase learning by arousing curiosity.[3] Kinder stated
several values of films and filmstrips as well as other
audio-visual aids when he wrote:

They show inaccessible processes, materials, events
and things, and changes in time, speed, and space. They
induce greater acquisition and longer retention of
factual information. They produce objectivity in the

[1]Sands, op. cit., p. 10.

[2]"Audio-Visual Materials," Encyclopedia of Educational
Research, Rev. Ed. (Macmillan, 1950), p. 84, cited by Edgar
Dale, Audio-Visual Methods in Teaching (New York: Dryden
Press, 1954), p. 65.

[3]Florence B. Freedman and Esther L. Berg, Classroom
Teachers Guide to Audio-Visual Materials (Philadelphia:
Chilton Company, Book Division, 1961), p. 6.

study of delicate or controversial subjects. They stimulate interest in voluntary reading. They give all members of a group the opportunity to share an experience. They facilitate attitude and behavior changes. They get and hold the attention of almost all students. They bring experts and multiple resources to the classroom. They provide for a direct contact of students with the realities of their social and physical environment. They provide integrated experiences which vary from the concrete to the abstract. They are valuable for all age and ability groups. They illustrate and clarify non-verbal symbols and images, quantitative relationships, complex and abstract relationships, time and spatial relationships (and) specific details. They reinforce verbal messages by providing a multi-media approach.[1]

When films are used purely for motivational purposes there appears to be some improvement of learning. Tremens in his research found a significant improvement in the work of the boys (not the girls, however) in the first year algebra classes in seventeen Iowa schools. He worked with three groups. One group was shown motivational films; one, motivational booklets; and the control group was taught in the customary manner. At the five per cent level of confidence the only significant difference among the three groups was found in the male subjects being shown motivational films. There was no significant difference between any of the other groups.[2]

[1]James S. Kinder, Using Audio-Visual Materials in Education, (New York: American Book Company, 1965), p. 14.

[2]Robert Kent Tremens, "The Comparative Effectiveness of Sound Motion Pictures and Printed Communications for the Motivation of High School Students in Mathematics," (unpublished Doctoral Dissertation, State University of Iowa, 1962), Dissertation Abstracts.

Audio-visual aids including films and filmstrips were found capable of stepping up the efficiency of teaching by 25 to 50 per cent, measuring the time saved and the teaching personnel freed for other tasks, and by incalculable percentages if the measure be thoroughness of learning done.[1] Other general advantages of films and filmstrips include their attractiveness, if well made and the use of a darkened room tends to compel attention.[2] Individual use out of class can be very fruitful also where it is economically feasible and well planned.[3] Planning seems to be the key to the advantageous use of any film or filmstrip.

When considering films and filmstrips specifically in relation to mathematics some additional attributes are found. They visualize abstract ideas so that they have meaning and provide complex drawings of three-dimensional effects. The teacher is capable of bringing to the school and the classroom important firsthand accounts of new activities in mathematics and mathematics education. Films and filmstrips help build favorable attitudes toward, and interest in, mathematics and are good materials for presenting

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[1]Sands, op. cit., p. 6.

[2]John Backman, How to Use Audio-Visual Materials (New York: Association Press, 1962), p. 25.

[3]W. H. Geisz and others, "Modern Teaching Methods for Modern Mathematics," National Association of Secondary School Principals Bulletin, LII (April, 1968), p. 137.

the history of mathematics and other enrichment topics. They illustrate the discovery of relationships or principles and applications of mathematics in our world. They make it possible to present dynamic ideas that depend on motion. Films provide correlation of mathematics with other subjects by presenting supplementary material. They provide an efficient method of review.[1]

Films and filmstrips can be useful: as a means of helping students discover concepts and principles; as a means of motivation, enriching instruction, and varying instructional activities. They are useful in introducing a unit or concept, simulating life situations, describing applications, and providing a means of correlating concepts and teaching for transfer. They help provide for individual differences. They are useful in preparing for a field trip and in providing follow-up activities. Films and filmstrips have been found useful in showing teachers how to teach the topic.[2] There are seven ways teaching aids provide the above mentioned uses or objectives. They function as follows:

[1]Donovan A. Johnson and Gerald R. Rising, Guidelines for Teaching Mathematics (Belmont, California: Wadsworth Publishing Company, Inc., 1967), p. 235-6.

[2]Emil J. Berger and Donovan A. Johnson, A Guide to the Use and Procurement of Teaching Aids for Mathematics (Washington, D. C.: National Council of Teachers of Mathematics, 1959), pp. 3-4.

(1) By giving concrete representation to abstract ideas,
(2) By relating new ideas to previous experience or
previously learned concepts, (3) By obtaining active
participation of the learner in the learning activity,
(4) By concentrating interest and attention, (5) By
speeding up communication, (6) By speeding up considera-
tion of secondary details, (7) By consolidating under-
standings that are related to the concept being taught.[1]

Disadvantages

There are, of course, some disadvantages or problems
in the use of films and filmstrips. If the teacher trying
to make use of them is not trained or has not prepared well
for the particular film he is using, much of its effective-
ness may be lost. "The audio-visual device misused or
bungled by someone who has failed to foresee the end from
the beginning will contribute less to education than to
frustration."[2] Failure to select appropriate teaching aids
and failure to use them properly can destroy their effec-
tiveness. The excessive use of films and filmstrips may
lead to overdependence on physical representation and in-
ability to work with the symbolic representation of an
abstraction. The indiscriminate use of teaching aids may
occasionally result in pure entertainment. The improper use
of teaching aids may create confusion and misconception.[3]

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[1] Ibid.

[2] Lester B. Sands, _Audio-Visual Procedures in Teaching_
(New York: The Ronald Press Company, 1956), p. 7.

[3] Berger and Johnson, op. cit., p. 4.

Films in particular are expensive and require a rather high level of skill in their effective use.[1] Therefore, if the teacher does not possess the needed training it would seem films and filmstrips might not be the best investment, at least, until the teacher can be provided with some forms of training in their use.

Many films and filmstrips cover very limited materials and often in a manner not entirely compatible with the text being used, thus making such activity an uneconomical use of time.[2] They also tend to become obsolete quickly.[3] The fixed sequence found in filmstrips lacks flexibility in usage. Films and filmstrips are easily smeared, scratched or torn. Johnson lists nine deficiencies of audio-visual aids, including films and filmstrips, in regard to mathematics courses. They are:

> (1) Treatment of topics exactly parallels textbook treatment, (2) Too much material is covered in a single film or filmstrip, (3) Applications and illustrations are lacking in interest to the student, (4) Drawings are too frequently used in place of photographs, (5) Commentary and situations are unrealistic, (6) Showing can not be a complete substitute for concrete experience, (7) Presentations are sometimes used as substitutes for good teaching, (8) Available audio-visual aids are not comprehensive for any subject or topic, (9) Some

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[1] Backman, loc. cit.

[2] Geisz, loc. cit.

[3] Sands, op. cit., p. 29.

audio-visual aids contain mathematical inaccuracies.[1]

III. REQUIREMENTS FOR EFFICIENT USE OF
FILMS AND FILMSTRIPS

When a teacher is preparing to use a film or film-strip in a classroom for instructional purposes, there are some requirements he should consider. Films, to be educationally worthwhile, must:

> (1) be appropriate to the stage of development of the pupils, (2) provide a content that is of direct interest and value to them, (3) be related to their curriculum by virtue of important information or inspiration, (4) be authentic and truthful in substance and treatment, and (5) have technical merit - good photography, sound, and general arrangement, besides, of course, general good taste.[2]

There are three standard procedures to follow in the use of films or filmstrips. If any of the three are not carefully followed the value of the film is reduced or lost. These procedures are (1) preparing the students for what they are to see, (2) showing it under adequate conditions, and (3) following it up with appropriate activities.[3] Backman has made a list of physical arrangements to be made in advance of the showing of a film or filmstrip. They are

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[1]Johnson and Rising, op. cit., pp. 245-6.

[2]Lester B. Sands, Audio-Visual Procedures in Teaching (New York: The Ronald Press, 1956), p. 356.

[3]Ibid., p. 353.

paraphrased as follows:

General Provisions

1. Be thoroughly familiar with all equipment.
2. Check physical conditions of the materials to be used.
3. Provide adequate room ventilation.
4. Locate adequate electrical outlets and cords.
5. Avoid placing cords where people might trip over them.
6. If necessary, provide adequate light for reading script.

Provisions for Sound

1. Place loudspeaker near screen and adjust loudness so all can hear comfortably.
2. If recording is used with filmstrip, rehearse syncronization.

Provisions for Light

1. Arrange seats so all can see clearly.
2. Place projector high enough that no center aisle is necessary.
3. Clean lens, screen, etc.
4. Focus projection beam high enough so all can see but not at such an angle as to cause distortion.
5. Recheck threading procedure of motion picture projector.[1]

The problem of preparing the students and following up with appropriate activities would seem to vary with the group and the film. The students should be informed as to why they are to see the film. They should be informed of any vocabulary which might be needed. Any mistakes in the films should be pointed out before they see it. They should

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[1]John Backman, How to Use Audio-Visual Materials (New York: Association Press, 1962), pp. 41-43.

also receive an indication as to what particular things they are to look for in the film. After the showing there should be time for questions and a review of the main points they will be expected to remember.

IV. A LISTING OF FILMS AND FILMSTRIPS

Procedures Used in Obtaining the List

Since in most listings of films and filmstrips there is no indexing done beyond the major subject field, the writer chose to classify the films and filmstrips presented into eight categories based on the content of the film as it was described in "The Mathematics Teacher." The categories were: (1) Historical, (2) Motivational, (3) Numbers and Number Systems, (4) Algebraic Expressions, (5) Equations, (6) Formulas, (7) Logarithms, and (8) Graphing. There were many other possible categories which could have been used but the writer chose these as major headings which seemed to fit the type of films involved without making an excessive number of different categories.

Many of the films and filmstrips included in the list to follow were presented in a regular department of the magazine "The Mathematics Teacher" entitled "Reviews and Evaluations." The articles present reviews of books concerned with mathematics and occasionally evaluations of some films or filmstrips. The remainder of the films and filmstrips

presented in this report were taken from a committee report
presented in the December 1963 issue of "The Mathematics
Teacher." The report was entitled "Reviews of Films: Films
Prepared for Use in Secondary School Mathematics Classes
and in Teacher Education Classes."

Of the reviews from all issues since January 1955,
the writer of this report chose only those films which per-
tained to algebra and which were given a satisfactory or
better rating based on the evaluations presented. When a
film was given an evaluation more than once at least one of
those critiques had to be satisfactory. If an evaluation
stated there was a gross error in the film or filmstrip or
gave some other reason for treating it as undesirable the
writer chose to omit it from the listing.

The films have been presented alphabetically by title
in this report under the previously mentioned categories.
The title is followed by an indication of the presence or
absence of sound; whether the film is available in color or
only black and white; the approximate length, if indicated
in the review; the categories of students for whom the film
or filmstrip was primarily made, the distributor; and the
volume, issue, and page number of the particular issue of
"The Mathematics Teacher" in which the evaluation was found.
Many of the films in the following list were part of a series,
therefore, the series which contained films included in the

list were listed separately at the beginning of the list.
Prices were not included in this report since the study
included films listed during the past thirteen years and
they are subject to price change since the publication of
their critiques. The list of films and filmstrips described
above follows.

A List of Films and Filmstrips for Algebra

Film Series

Advanced Algebra Series. 20 films, 19 0. sd, bw; sh, jc;
tchrs. of sh.[1] Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963.[2] p. 581.

Adventures in Number and Space Series. 9 films, 1958. sd,
bw; el, jh, sh, a, tchrs. of el., jh. Association Films,
Inc. Vol. LVI, no. 8. Dec. 1963. p. 584.

Engineering Problems. 6 films, 1958. sd, bw; sh, jd.
Bureau of Audio-Visual Instruction, State University of Iowa.
Vol. LVI, no. 8. Dec. 1963. p. 589.

Intermediate Algebra Series. 24 films, 1959. sd, bw; sh,
jc. Modern Learning Aids. Vol. LVI, no. 8. Dec., 1963.
p. 591.

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[1]The following is a key to the symbols used:
sd: sound   sh: senior high
si: silent   jc: junior college
bw: black and white   a: adult
co: color   guide: teacher's guide available
el: elementary   manual: student's manual available
jh: junior high

[2]Volume, number, and page refer to the issue and page
number in "The Mathematics Teacher" published in Washington,
D. C. by the National Council of Teachers of Mathematics,
Inc., in which the particular film or filmstrip was
evaluated.

Junior High Film Series. 6 films, 1962. sd, bw; jh; tchrs.
of jh; guide. Educational Research Council of Greater
Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

McGraw-Hill Teacher Education Series. 5 films, 1959. sd,
bw; jh, sh; tchrs. of el., jh, sh; guide. McGraw-Hill Text
Films. Vol. LVI, no. 8. Dec. 1963. p. 597.

Understanding Numbers. 7 films. sd, bw; jh, sh, jc, sc,
a; tchrs. of el., jh, sh. University of Michigan TV. Vol.
LVI, no. 8. Dec. 1963. p. 604. or Audio-Visual Center,
Indiana University, Bloomington, Indiana. Vol. XLIX, no. 3.
March 1956. p. 209-210.

Filmstrip Series

Amazing Arithmetic Set. 9 filmstrips. si, co; el, jh;
guide. Eye Gate House, Inc. Vol. XLIX, no. 3. March 1956.
p. 210.

Man and Measures. 4 filmstrips. si, co; jh, sh. The
Filmstrip House. Vol. XLIX, no. 4. April 1956. p. 300.

Measurements are for a Purpose. 2 filmstrips, 1962. sd,
co; sh, jc. Society For Visual Education, Inc. Vol. LVII,
no. 8. Dec. 1964. p. 559.

Modern Elementary Algebra-Group I. 5 filmstrips. si, co;
jh. Society for Visual Education, Inc. Vol. LVI, no. 3.
March 1963. p. 169-170.

Modern Elementary Algebra-Group II. 5 filmstrips, 1962.
si, co; jh. Society for Visual Education, Inc. Vol. LVI,
no. 5. May 1963. p. 361-362.

Using and Understanding Numbers, Decimals, and Measurements.
7 filmstrips. si, co; el, jh. Society for Visual Education,
Inc. Vol. L, no. 1. Jan. 1957. p. 76.

Historical Films

The Earliest Numbers. sd, bw; 30 min.; jh, sh, jc, sc, a;
tchrs. of el, jh, sh. University of Michigan TV. Vol. LVI,
no. 8. Dec. 1963. p. 604. or Audio-Visual Center, Indiana
University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956.
p. 209.

Fractions. sd, bw; 30 min.; jh, sh, a; tchrs. of el, jh, sh. University of Michigan TV. Vol. LVI, no. 8. Dec. 1963. p. 605 or Audio-Visual Center, Indiana University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956. p. 210.

Historical Introduction to Algebra. sd, bw; 27 min.; jh, sh, jc; tchrs. of jh, sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 581.

The Idea of Numbers: An Introduction to Number Systems. 1960. sd, co; 14 min.; el, jh; tchrs. of el, jh. International Film Bureau, Inc. Vol. LVI, no. 8. Dec. 1963. p. 591.

The Meaning of Pi. 1949. sd, bw or co; 12 min.; jh, sh. Coronet Instructional Films. Vol. LVI, no. 8. Dec. 1963. p. 598.

Historical Filmstrips

Early Counting. si, co; jh, sh. The Filmstrip House. Vol. XLIX, no. 4. April 1956. p. 300.

Early Measuring. si, co; jh, sh. The Filmstrip House. Vol. XLIX, no. 4. April 1956. p. 300.

Early Time Telling. si, co; jh, sh. The Filmstrip House. Vol. XLIX, no. 4. April 1956. p. 300.

Standards and Measurements. (54 frames) sd, co; jh, sh, jc. Society For Visual Education, Inc. Vol. LVII, no. 8. Dec. 1964. p. 559.

Measurement Systems and Theory. (52 frames) sd, co; jh, sh, jc. Society For Visual Education, Inc. Vol. LVII, no. 8. Dec. 1964. p. 559.

Motivational Films

Arrangements and Combinations. sd, bw; 30 min.; el, jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 585.

Big Numbers. sd, bw; 30 min.; jh, sh, jc, sc, a; tchrs. of el, jh, sh. University of Michigan TV. Vol. LVI, no. 8. Dec. 1963. p. 604 or Audio-Visual Center, Indiana University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956. p. 209.

Careers in Mathematics. sd, bw; 30 min.; jh, sh; tchrs. of el, jh, sh. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 585.

Electronic Computers and Mathematics. 1961. sd, bw or co; 25 min.; jh, sh, jc, a; tchrs. of jh, sh. John Colburn Associates, Inc., Wilmette, Ill. Vol. LVI, no. 8. Dec. 1963. p. 587.

How Man Learned to Count. sd, bw; 30 min.; el, jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 584.

Hows Chances. sd, bw; 30 min.; jh, a. Association Films, Inc. Vol LVI, no. 8. Dec. 1963. p. 585.

Language of Algebra. sd, bw; 30 min.; jh, sh; tchrs. of jh, sh, guide. Educational Research Council of Greater Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

Language of Algebra. 1960. sd, co; 16 min.; jh. International Film Bureau. Vol. LVI, no. 8. Dec. 1963. p. 596. or Vol. LIV, no. 4. April 1961. p. 269.

Mysterious X. sd, bw; 30 min.; el, jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 584.

Patterns in Mathematics. sd, bw; 14 min.; jh, sh; tchrs. of jh, sh; guide. McGraw-Hill Text Films. Vol. LVI, no. 8. Dec. 1963. p. 598.

Quicker Than You Think. sd, bw; 30 min.; el, jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 584.

Sign Language. sd, bw; 30 min.; jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 585.

Stretching Imagination. sd, bw; 30 min.; jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 585.

Symbols in Algebra. 1961. sd, bw or co; jh, sh. Coronet Instructional Films. Vol. LVI, no. 8. Dec. 1963. p. 600.

Time. 1959. sd, bw or co; 15 min.; el, jh, sh, jc, a; tchrs. of el, jh, sh. Indiana University. Vol. LVI, no. 8. Dec. 1963. p. 600.

Variation: A Lesson in Reading. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 593.

What's the Angle? sd, bw; 30 min.; el, jh, a. Association Films, Inc. Vol. LVI, no. 8. Dec. 1963. p. 584.

Numbers and Number Systems (Films)

Base and Place. sd, bw; 30 min.; sh, jc, sc, a; tchrs. of el, jh, sh. University of Michigan TV. Vol. LIV, no. 8. Dec. 1963. p. 604. or Audio-Visual Center, Indiana University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956. p. 209.

Decimal Numerals. sd, bw; 30 min.; jh, sh; tchrs. of el, jh, sh; guide. Educational Research Council of Greater Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

Fundamental Operations. sd, bw; 30 min.; jh, sh, jc, sc, a; tchrs. of el, jh, sh. University of Michigan TV. Vol. LIV, no. 8. Dec. 1963. p. 608. or Audio-Visual Center, Indiana University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956. p. 209.

How Do You Count? sd, co; el, jh. International Film Bureau, Inc. Vol. LVII, no. 6. Oct. 1964. p. 413.

The Integers. sd, bw; 30 min.; sh, jc, sc, a; tchrs. of sh; guide. Educational Research Council of Greater Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

New Numbers. sd, bw; 30 min.; sh, jc, sc, a; tchrs. of sh. University of Michigan TV. Vol. LVI, no. 8. Dec. 1963. p. 605. or Audio-Visual Center, Indiana University, Bloomington, Ind. Vol. XLIX, no. 3. March 1956. p. 210.

The Number System and Its Structure. 1961. sd, co, bw; 11 min., jh, sh; guide. Coronet Instructional Films. Vol. LVI, no. 8. Dec. 1963. pp. 598-599.

Numeration Systems. sd, bw; 30 min.; jh; tchrs. of el, jh; guide. Educational Research Council of Greater Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

Radicals and the Real Number System. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 593.

The Rational Numbers. sd, bw; 30 min.; jh, sh; tchrs. of jh, sh; guide. Educational Research Council of Greater Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

Roots of Higher Order. sd, bw; 30 min.; sh, jc; tchrs. of
sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963.
p. 593.

The Whole Numbers. sd, bw; 30 min.; jh, sh; tchrs. of el,
jh, sh; guide. Educational Research Council of Greater
Cleveland. Vol. LVI, no. 8. Dec. 1963. p. 595.

Numbers and Number Systems (Filmstrips)

Addition and Subtraction of Decimals. si, co; el, jh.
Society For Visual Education, Inc. Vol. L, no. 1. Jan. 1957.
p. 76.

Advancing in Linear Measurement. si, co; el, jh. Society
For Visual Education, Inc. Vol. L, no. 1. Jan. 1957.
p. 76.

Advancing in Quantity Measurement. si, co; el, jh. Society
For Visual Education, Inc. Vol. L, no. 1. Jan. 1957.
p. 76.

Changing Fractions to Decimals-Decimals to Fractions. si,
co; el, jh. Society For Visual Education, Inc. Vol. L,
no. 1. p. 76.

The Closure, Commutative, and Associative Properties.
(51 frames) si, co; jh. Society For Visual Education, Inc.
Vol. LVI, no. 3. March 1963. p. 170.

Division of Decimals. si, co; el, jh. Society For Visual
Education, Inc. Vol. L, no. 1. Jan. 1957. p. 76.

Fraction Facts. si, co; el, jh. Eye Gate House, Inc.
Vol. XLIX, no. 3. March 1956. p. 210.

Fraction Forms. si, co; el, jh. Eye Gate House, Inc.
Vol. XLIX, no. 3. March 1956. p. 210.

Identity and Inverse Properties. (55 frames) si, co; jh.
Society For Visual Education, Inc. Vol. LVI, no. 5.
May 1963. p. 362.

Knowing Numbers. si, co; el, jh. Eye Gate House, Inc.
Vol. XLIX, no. 3. March 1956. p. 210.

The Language of Sets. (53 frames) si, co; jh. Society
For Visual Education, Inc. Vol. LVI, no. 3. March 1963.
p. 170.

Meaning and Reading of Decimals. si, co; el, jh. Society
For Visual Education, Inc. Vol. L, no. 1. Jan. 1957.
p. 76.

Multiplication of Decimals. si, co; el, jh. Society For
Visual Education, Inc. Vol. L, no. 1. Jan. 1957. p. 76.

Negative Numbers. (59 frames) si, co; jh. Society For
Visual Education, Inc. Vol. LVI, no. 3. March 1963.
p. 170.

Order Properties. (51 frames). si, co; jh. Society For
Visual Education, Inc. Vol. LVI, no. 5. May 1963. p. 362.

Zero - the Forgotten Number. si, co; el, jh. Eye Gate
House, Inc. Vol. XLIX, no. 3. March 1956. p. 210.

Algebraic Expressions (Films)

Addition and Subtraction of Rational Numbers. sd, bw; 30
min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
No. 8. Dec. 1963. p. 591.

Algebraic and Complex Fractions. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963. p. 592.

Determinants of Any Order. sd, bw; 30 min.; sh, jc; tchrs.
of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963.
p. 582.

Five Fundamental Postulates of Algebra. sd, bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
no. 8. Dec. 1963. p. 581.

Imaginary and Complex Numbers. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963. p. 593.

Introduction to Factoring. sd, bw; 30 min.; sh, jc; tchrs.
of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963.
p. 581.

Irrational Numbers. sd, bw; 23 min.; jh, sh, jc, sc; tchrs.
of jh, sh; guide. McGraw-Hill Text Films. Vol. LVI, no. 8.
Dec. 1963. p. 598.

Multiplication of Rational Numbers. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 591.

Natural Numbers, Integers and Rational Numbers. sd, bw; 30 min.; jh, sh, jc; tchrs. of jh, sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 591.

Number Fields. sd, bw; 17 min.; sh, jc, sc; tchrs. of jh, sh; guide. McGraw-Hill Text Films. Vol. LVI, no. 8. Dec. 1963. p. 598.

Progressions, Sequences and Series. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 594.

Simplifying Complex Fractions. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 582.

Special Products and Factoring. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 592.

Standard Techniques for Factoring. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 582.

Using Fractional and Rational Exponents. sd, bw; 28 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 593.

Working with Positive and Negative Exponents. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 593.

Algebraic Expressions (Filmstrips)

Different Differences. si, co; el, jh. Eye Gate House, Inc. Vol. XLIX, no. 3. March 1956. p. 210.

Fraction Findings. si, co; el, jh. Eye Gate House, Inc. Vol. XLIX, no. 3. March 1956. p. 210.

Pleasing Products. si, co; el, jh. Eye Gate House, Inc. Vol. XLIX, no. 3. March 1956. p. 210.

Quotient Quests. si, co; el, jh. Eye Gate House, Inc.
Vol. XLIX, no. 3. March 1956. p. 210.

Some Sums. si, co; el, jh. Eye Gate House, Inc. Vol.
XLIX, no. 3. March 1956. p. 210.

Subtraction and Division. si, co; jh. Society For Visual
Education, Inc. Vol. LVI, no. 5. May 1963. p. 362.

Equations (Films)

Complex Numbers and Roots of Equations. sd, bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
no. 8. Dec. 1963. p. 583.

Concept of a Function. sd, bw; 16 min.; jh, sh, jc, sc;
tchrs. of jh, sh; guide. McGraw-Hill Text Films. Vol. LVI,
no. 8. Dec. 1963. pp. 597-598.

Determinants and Cramer's Rule. sd. bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963. p. 582.

Developing and Solving Linear Equations. sd. bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
no. 8. Dec. 1963. p. 591.

Equations in Algebra. sd, co; jh. International Film
Bureau, Inc. Vol. LVII, no. 6. Oct. 1964. p. 413.

Equations with Unknowns in the Exponents. sd, bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
no. 8. Dec. 1963. p. 594.

General Method of Solving Quadratic Equations. sd, bw;
30 min.; sh, jc; tchrs. of sh. Modern Learning Aids.
Vol. LVI, no. 8. Dec. 1963. p. 594.

Introduction to Quadratic Equations. sd, bw; 30 min.; sh,
jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963. p. 582.

Introduction to Simultaneous Equations. sd, bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI,
no. 8. Dec. 1963. p. 582.

Linear Equations in One Unknown. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 582.

More Solutions of Linear Equations. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 592.

Proportions at Work. sd, bw, co; 11-12 min.; jh, sh. International Film Bureau, Inc. Vol. LVI, no. 8. Dec. 1963. p. 599. or Vol. LV, no. 5. May 1962. p. 406.

Quadratic Equations. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963.

Sentences and Solution Sets. sd, bw; 21 min.; jh, sh; tchrs. of el, jh, sh; guide. McGraw-Hill Text Films. Vol. LVI, no. 8. Dec. 1963. p. 597.

Solution of Equations Beyond the Second Degree. sd, bw; 32 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 583.

Solving Equations in Fractional Form. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 593.

Solving Problems with the Quadratic Formula. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 582.

Solving Simultaneous Linear Equations. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 592.

Using Logarithms to Solve Equations. sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8. Dec. 1963. p. 594.

Equations (Filmstrips)

The Distributive Property. (40 frames) si, co; jh. Society For Visual Education, Inc. Vol. LVI, no. 5. May 1963. p. 362.

Equivalent Open Sentences. (62 frames) si, co; jh. Society For Visual Education, Inc. Vol. LVI, no. 5. May 1963. p. 362.

Open Sentences. (51 frames) si, co; jh. Society For
Visual Education, Inc. Vol. LVI, no. 3. March 1963.
p. 170.

Formulas (Films)

Formulas in Mathematics. sd, co; 10 1/2 min.; jh. Inter-
national Film Bureau, Inc. Vol. LIV, no. 1. Jan. 1961.
p. 46.

Permutations and Combinations. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids. Vol. LVI, no. 8.
Dec. 1963. p. 583.

Possibly So, Pythagoras. sd, co; jh, sh. International
Film Bureau, Inc. Vol. LVII, no. 6. Oct. 1964. p. 413.

Pythagorean Theorem: Proof By Area. 1960. sd, bw;
5 1/2 min.; jh, sh. Coronet Instructional Films. Vol. LVI,
no. 8. Dec. 1963. p. 599.

Logarithms (Films)

Computing Logarithms from Arithmetic and Geometric Series.
sd, bw; 30 min.; sh, jc; tchrs. of sh. Modern Learning Aids,
Inc. Vol. LVI, no. 8. Dec. 1963. p. 583.

Logarithmic Operations I and II. sd, bw; 27 min. each;
sh, jc, a. Bureau of Audio-Visual Instruction, State Uni-
versity of Iowa. Vol. LVI, no. 8. Dec. 1963. p. 590.

Logarithmic Systems. sd, bw; 21 min.; sh, jc, a. Bureau
of Audio-Visual Instruction, State University of Iowa.
Vol. LVI, no. 8. Dec. 1963. p. 590.

Logarithms - Characteristics. sd, bw; 26 min.; sh, jc, a.
Bureau of Audio-Visual Instruction, State University of
Iowa. Vol. LVI, no. 8. Dec. 1963. p. 590.

Mantissas. sd, bw; 26 min.; sh, jc, a. Bureau of Audio-
Visual Instruction, State University of Iowa. Vol. LVI,
no. 8. Dec. 1963. p. 590.

Nature of Logarithms. sd, bw; 30 min.; sh, jc; tchrs. of
sh. Modern Learning Aids, Inc. Vol. LVI, no. 8. Dec. 1963.
p. 583.

Short Cuts. sd, bw; 30 min.; jh, sh, jc. Audio-Visual
Center, Indiana University, Bloomington, Ind. Vol. XLIX,
no. 3. March 1956. pp. 209-210.

Trigonometric Applications. sd, bw; 32 min.; sh, jc, a.
Bureau of Audio-Visual Instruction, State University of
Iowa. Vol. LVI, no. 8. Dec. 1963. p. 590.

Using Logarithms in Problems. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids, Inc. Vol. LVI, no. 8.
Dec. 1963. p. 583.

Graphing (Films)

Algebra of Points and Line. sd, bw; 30 min.; sh, jc; tchrs.
of sh. Modern Learning Aids, Inc. Vol. LVI, no. 8. Dec.
1963. p. 593.

Equations and Graphs of the Parabola. sd, bw; 30 min.;
sh, jc; tchrs. of sh. Modern Learning Aids, Inc. Vol. LVI,
no. 8. Dec. 1963. p. 594.

Graphing Linear Equations. 1961. sd, co, bw; 12 min.; jh,
sh; guide. Coronet Instructional Films. Vol. LVI, no. 8.
Dec. 1963. p. 591.

Graphs of Quadratic Equations. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids, Inc. Vol. LVI, no. 8.
Dec. 1963. p. 583.

Hyperbola, Ellipse and Circle. sd, bw; 30 min.; sh, jc;
tchrs. of sh. Modern Learning Aids, Inc. Vol. LVI, no. 8.
Dec. 1963. p. 594.

Introduction to Graphs of Equations. sd, bw; 30 min.; sh,
jc; tchrs. of sh. Modern Learning Aids, Inc. Vol. LVI,
no. 8. Dec. 1963. p. 583.

Language of Graphs. 1948. sd, bw, co; 13 min.; jh.
Coronet Instructional Films. Vol. LVI, no. 8. Dec. 1963.
p. 596.

Graphing (Filmstrips)

The Number Line. (47 frames) si, co; jh. Society For
Visual Education, Inc. Vol. LVI, no. 3. March 1963. p. 170.

V. SUMMARY

The purpose of this report was to acquaint teachers of algebra with the advantages and disadvantages of using films and filmstrips in algebra classes, to determine some requirements for the efficient use of films and filmstrips, and to list and categorize some of the films available for use in algebra classes.

Advantages of the use of films and filmstrips in algebra classes include the following. They supply a concrete basis for conceptual thinking, have a high degree of interest, make learning more permanent, offer reality of experience, develop continuity of thought, contribute to vocabulary development and contribute to the efficiency, depth, and variety of learning. Films and filmstrips stimulate interest and are capable of stepping up efficiency of teaching. They visualize abstract ideas and provide intricate and three dimensional drawings. Films and filmstrips are advantageous in correlating algebra with other subjects.
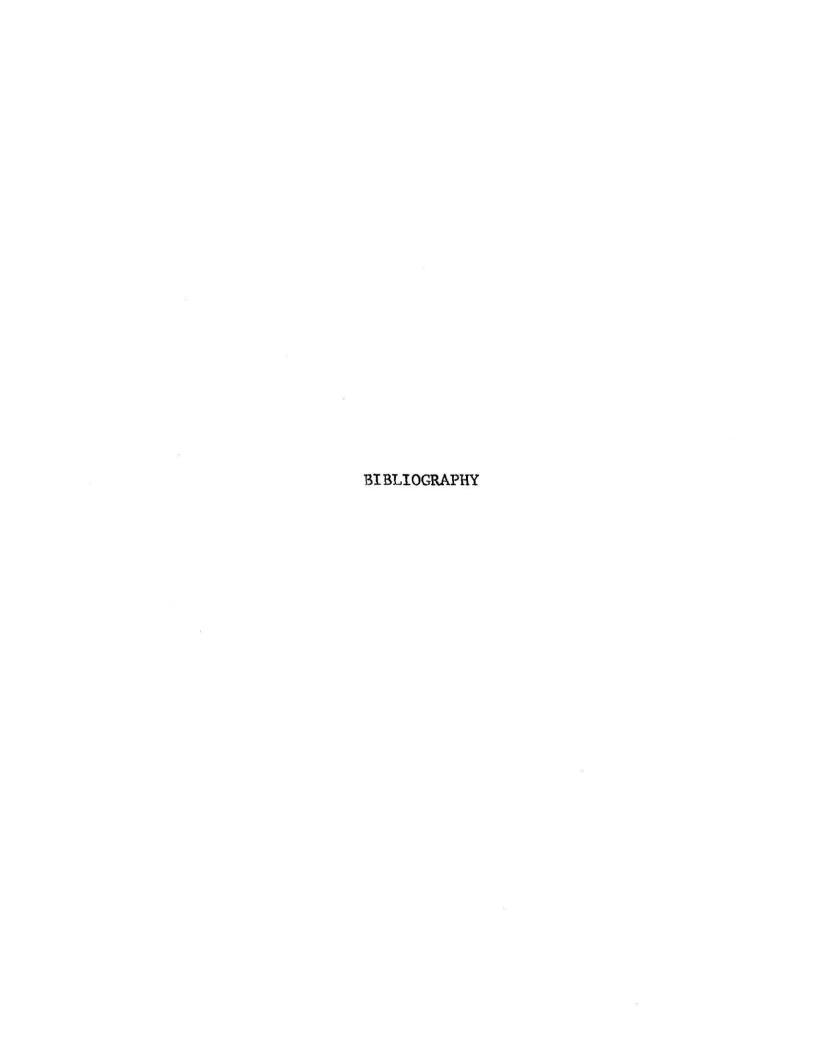
One problem in the use of films and filmstrips is the careful preparation of both the teacher and class necessary for the film or filmstrip to produce the desired effect. Films and filmstrips are misused as a substitute for good teaching or as entertainment for the class. When used too extensively, classes develop a reliance on the films and filmstrips and are unable to think mathematical concepts

through with out the aid of films. Films may cover very
limited material or may exactly parallel the textbook pre-
sentation rendering their use an inefficient expenditure of
time and money.

There are three basic steps in the correct use of
films and filmstrips in the classroom. They are (1) prepare
the students for what they are to see, (2) show it under
adequate conditions, and (3) follow it up with appropriate
activities.

Finally the report listed some films available to
teachers of algebra grouping those films according to con-
tent into eight categories: (1) Historical, (2) Motivational,
(3) Numbers and Number Systems, (4) Algebraic Expressions,
(5) Equations, (6) Formulas, (7) Logarithms, and (8) Graph-
ing. One hundred-twenty films and filmstrips were listed
in the various categories along with the issue and page
number where each film or filmstrip was evaluated in "The
Mathematics Teacher."

BIBLIOGRAPHY

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A. BOOKS AND PAMPHLETS

Backman, John W. How to Use Audio-Visual Materials. New York: Association Press, 1956. Fourth Printing, 1962.

Berger, Emil J. "Principles Guiding the Use of Teacher and Student-Made Learning Aids," Emerging Practices in Mathematics Education. pp. 158-170. Twenty-second Yearbook of National Council of Teachers of Mathematics. Washington, D. C., 1954.

_____, and Donovan A. Johnson. A Guide to the Use and Procurement of Teaching Aids for Mathematics. Washington, D. C.: National Council of Teachers of Mathematics, 1959.

Dale, Edgar. Audio-Visual Methods in Teaching. New York: Dryden Press, 1954.

DeKieffer, Robert E. and Lee W. Cochran. Manual of Audio-Visual Techniques. Englewood Cliffs, New Jersey: Prentice Hall, 1962.

Erickson, Carlton W. Fundamentals of Teaching With Audio-Visual Technology. New York: The Macmillan Company, 1965.

Freedman, Florence B. and Esther L. Berg. Classroom Teachers Guide to Audio-Visual Material. Philadelphia: Chilton Company, Book Division, 1961.

Johnson, Donovan A. and Gerald R. Rising. Guidelines for Teaching Mathematics. Belmont, California: Wadsworth Publishing Company, 1967.

Kinder, James Screngo. Audio-Visual Materials and Techniques. New York: American Book Company, 1950.

_____. Using Audio-Visual Materials in Education. New York: American Book Company, 1965.

Sands, Lester B. Audio-Visual Procedures in Teaching. New York: The Ronald Press Company, 1956.

Tauber, Maurice F. and Irlene Roimer Stephens. _Conference on the Use of Printed and Audio-Visual Materials for Instructional Purposes - Final Report._ Title VII, Project B 546, NDEA 1958, Contract no. OE-5-16-034. United States Department of Health, Education, and Welfare, Office of Education, New York: Columbia University School of Library Services, 1966.

Vollman, R., and P. Peak. _How to Use Films and Filmstrips in Mathematics Classes._ Washington, D. C.: National Council of Teachers of Mathematics, 1960.

B.   FILMS

Choosing a Classroom Film. McGraw-Hill, 1963.

C.   PERIODICALS

Dessart, D. J. "Mathematics in the Secondary School; Programmed Instruction, Television, and Motion Pictures," Report of Educational Research, XXXIV (June, 1964), 303-304.

Geisz, W. H. and others. "Modern Teaching Methods for Modern Mathematics," _National Association of Secondary School Principals Bulletin,_ LII (April, 1968), 129-140.

Hlavaty, J. H., and H. A. Ruderman. "How to Provide for the Mathematically Talented," _National Association of Secondary School Principals Bulletin,_ LII (April, 1968), 109-117.

Hoffman, R. I. "Slow Learner; Changing His View of Math," _National Association of Secondary School Principals Bulletin,_ LII (April, 1968), 86-97.

McIntosh, J., and P. Peak. "Materials of Instruction," _National Association of Secondary School Principals Bulletin,_ LII (April, 1968), 155-166.

Mathematics Teacher, The. Vol. XLVIII, no. 1 through Vol. LXI, no. 5 (January, 1955 through May, 1968), National Council of Teachers of Math.

Willoughby, S. S. "What's New in Mathematics," National Association of Secondary School Principals Bulletin, LII (April, 1968), 4-15.

D. UNPUBLISHED MATERIALS

Arbuckle, Edward W. "The Effectiveness of Modern Instructional Materials in a General Mathematics Class." Unpublished Master's Report, Kansas State University, Manhattan, Kansas, 1966.

Dean, Conrad H. "The Versatility of the Overhead Projector in Classroom Teaching." Unpublished Master's Report, Kansas State University, Manhattan, Kansas, 1966.

McBeath, R. J. "A Comparative Study on the Effectiveness of the Filmstrip, Sound Filmstrip and Filmograph for Teaching Facts and Concepts." Unpublished Doctoral Dissertation, University of Southern California, 1961. Dissertation Abstracts.

Tremens, Robert K. "The Comparative Effectiveness of Sound Motion Picture and Printed Communications for the Motivation of High School Students in Mathematics." Unpublished Doctoral Dissertation, State University of Iowa, 1962. Dissertation Abstracts.

FILMS AND FILMSTRIPS FOR ALGEBRA

by

LEONARD GEORGE PURVIS

B. S., Kansas State University, 1964

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1969

The purpose of this report was to acquaint teachers of algebra with the advantages and uses of films and filmstrips in the algebra classroom and to list those films and filmstrips which had been indicated as meritorious in the reviews found in "The Mathematics Teacher" since January, 1955. Only films and filmstrips which seemed to pertain to algebra were listed.

Many advantages of films and filmstrips were included. Films and filmstrips visualize abstract ideas and provide illustrations of applications of mathematics. They provide a good method of showing and teaching mathematics history. They make it possible to present dynamic ideas that depend on motion and complex three-dimensional effects. There are many other advantages in the careful use of films and filmstrips.

Disadvantages in the use of films and filmstrips also exist. One important problem is the lack of preparation many teachers have in the use of films and filmstrips. The use of these audio-visual aids without careful preparation both in the use of films and filmstrips in general and in the use of a particular film or filmstrip can have an adverse effect.

Films in particular are expensive. They tend to become old and spoiled by careless storage and repair. There are in some films and filmstrips mathematical

inaccuracies. These are a few of the disadvantages listed.

The physical requirements for the effective use of films and filmstrips were included in this report. Such things as proper room ventilation, proper placement of screen and projector to enable all to see and care of equipment were discussed. Preparation of the students is an important consideration. The students must be informed before viewing the film as to what they are to be looking for in the film, also any inaccuracies in the film must be explained before the film is viewed. A careful review immediately after the film is viewed is also an important requirement in the use of films and filmstrips. Other requirements in use of films and filmstrips were listed.

In listing the films considered in this report the writer chose eight categories for the grouping of these films and filmstrips. These categories were: (1) Historical, (2) Motivational, (3) Numbers and Number Systems, (4) Algebraic Expressions, (5) Equations, (6) Formulas, (7) Logarithms, and (8) Graphing. One hundred twenty films and filmstrips were listed in the various categories along with the issue and page number where the films were evaluated in "The Mathematics Teacher."