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A Study of Teacher Production of Two by Two Inch Photographic Projection Slides for classroom Instruction

Samuel Wesley Peach
Central Washington University

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A STUDY OF TEACHER PRODUCTION OF TWO BY TWO INCH PHOTOGRAPHIC
PROJECTION SLIDES FOR CLASSROOM INSTRUCTION

by

Samuel Wesley Peach

A thesis submitted in partial fulfillment of the requirements for
the degree of Master of Education, in the Graduate School
of the Central Washington College of Education

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August 7, 1952

This thesis has been read and approved by the
candidate's graduate committee.

Ass't. Prof. Alexander H. Howard, Jr., Chairman

Ass't. Prof. Mr. F. Bach

Ass't. Prof. Dr. Arthur H. Doerr

The writer would like to make use of this opportunity to express his gratitude to the members of his graduate committee; Mr. Bach, Dr. Doerr, and Dr. Howard.

A special consideration is due Dr. Howard, who served as the chairman of the committee. Through his constructive advice this report has progressed from its disarranged beginnings to a more pertinent and more readable form.

TABLE OF CONTENTS

CHAPTER	PAGE
I. FOUNDATIONS OF THE STUDY	1
Backgrounds of Slide Use	1
Varied Areas in Which Slides Are Effective	4
Some Considerations of this Study	7
II. THE PROBLEM AND THE METHOD	9
Advantages to Students through Local Slide Production	9
Advantages of Slide Production to Teachers	13
A Similar Study of this Problem	15
Further Questions this Study Must Answer	17
Sources of Information	18
Organization of the Remainder of the Study	21
III. THE PRACTICALITY OF THE PROBLEM	23
Time and Effort Required in Slide Construction	26
The Impact of Slide Construction within the Classroom	28
The Costs Involved in Slide Construction	28
IV. GUIDES TO PRODUCING EFFECTIVE TEACHING SLIDES	33
When Slides Are Needed	33
Children's Preferences for Slide Types	35
Black and White Versus Colored Slides	37
Planning a Slide Making Project	38
Evaluation of Slides	41

CHAPTER	PAGE
A Summary of the Planning Procedures	46
V. A WORKING PLAN FOR PRODUCTION	50
The Direct Positive Method of Slide Making	51
The Use of the Copy Stand	54
Focusing for Copy Work	55
Special Cautions to Observe During Copying	58
Copyrighted Materials	62
The Negative-Positive Methods of Slide Construction	62
A Home-Made Printing Frame	64
Continuous-Tone Slides	67
Judging Exposures	68
Three Additional Slide Making Methods	70
Masking and Binding Procedures	72
Glass Versus Paper Mounts	72
Identifying Data	74
Steps in Binding	75
VI. SUMMARY AND CONCLUSIONS	79
A Summarization of the Study	79
Limiting Factors of the Study	81
Conclusions and Recommendations	82
Resulting from the Study	
Implications for Further Study	83
APPENDIX	84
BIBLIOGRAPHY	96

TABLE OF FIGURES

FIGURE	PAGE
1. An Easily Made Copy Stand	57
2. Establishing the Proper Focus	59
3. An Easily Made Printing Frame	66
4. Steps in Masking and Binding	76

TABLE OF TABLES

TABLE	PAGE
1. Qualities Deemed Desirable in Teaching Slides by a Number of Authors	47
II. Materials and Equipment for Making Direct Positive Slides	53
III. Line-Copy Materials and Data for the Negative- Positive Process	65
IV. Continuous-Tone Materials and Data for the Negative- Positive Process	69

CHAPTER I

FOUNDATIONS OF THE STUDY

It was the purpose of this study to investigate the feasibility of teacher production of two by two inch projection slides for classroom use, and to report upon practical production methods if a real need for such a program is present.

Background of Slide Use

At present the two by two inch slide is potentially an important, but perhaps under-estimated, part of the audio-visual aids program. A brief analysis of the history of education will show that the use of visual aids, and still pictures particularly, is not a new concept --that picture representations of objects and ideas have long been considered significant in education.

The use of pictographs by ancient Egyptians illustrates the existence of picture representations of concrete objects as the basis upon which writing originated. As they progressed from the hieroglyphic to the hieratic and demotic phases, their symbols became increasingly abstract in nature, but these symbols were rooted in the "concrete".

Further examples of similar "still-visual" instruction in early history might include the use of sculpture by the Romans to tell of victories in wars. Later, the utilization of frescoes, statues, carvings, and marionettes in teaching religious lessons was common

practice among churchmen during the Middle Ages. Quintilian suggested that blocks be used in teaching children the alphabet.¹

Comenius advocated the use of a graduated series of textbooks and preliminary study of actual objects followed by study of the language used in connection with them. He is usually credited with having written the first illustrated textbook, the Orbis Pictus; because of this and his work emphasizing combined oral and pictorial presentations, he has been called the founder of audio-visual instruction.²

Another whose influence has been present from the early history of this field was Rousseau, who contended that instruction should start with physical activity in a natural setting and include varied experiences with natural objects through first hand contact and manipulation. Rousseau³ said:

In any study whatever, representative signs are of no account without the idea of the things represented... As all that enters the human understanding comes through the senses, the first reason of man is a sensuous reason; and it is this which serves as a basis for the intellectual reason. Our first teachers of philosophy are our feet, our hands, and our eyes. To substitute books for all these is not to teach us to reason, but to teach us to use the reason of others; it is to teach us to believe much and never to know anything.

1. Carroll, John S., Teacher Education for the Modern School, Education Monograph No. 16, San Diego: Office of the Superintendent of Schools, San Diego County, September, 1948, 9

2. Ibid., 10

3. McClusky, F. Dean, Audio-Visual Teaching Techniques, Dubuque, Iowa: William C. Brown Co., 1949, 28 ff

The problem of making schoolwork meaningful has been attacked by a host of outstanding educators including: Erasmus, Pestalozzi, Herbart, Locke, Froebel, and Dewey. This sampling of history would indicate that the use of audio-visual devices is not a new idea. Yet, since the time of the majority of the individuals mentioned above, tremendous advances have been made in instructional materials.

While the fundamental learning processes have not changed, the information students are expected to learn today is different in many respects from that of the past, and today children have an increased body of knowledge to master. With this in mind it must be concluded that every available help must be sought out and utilized. The modern educator should use the many improved tools which his predecessors never dared dream of. The potential of meaningful teaching has been increased immeasurably.

The Basis for Using Two by Two Slides in Teaching

The use of projection slides in the educational program is based upon the realization that verbal or language symbols must be complemented by concrete experiences and ideas. While in some minds the terms "audio-visual aids" and "moving pictures" are considered to be virtually synonymous, if this viewpoint is widely held, the pupils in the classroom will suffer. Learning processes are such that a most effective teaching method in one instance might be completely useless in another. Several studies have been made which will be of interest at this point.

McClusky and McClusky¹ studied the comparative effectiveness of six modes of presentation of certain subject matter. It was concluded that oral discussion adds to the learning when using visual aids, whether they be films, slides, or illustrations. In two cases films were superior to slides, and in two other cases the slides were superior to films. Slides were found to have given better results than "prints" in three out of four cases. Since the results of the learning were so inconsistent and indicated no distinct advantage for any method, the authors suggested that considering the greater cost of films, slides and prints be employed in teaching the material of this particular experiment.

Varied Areas in which Slides are Effective

Other studies have shown the effectiveness of teaching with projected slides. Beglinger² studied the results obtained in teaching English to a group of adult foreigners. One group had the advantage of slide and stereograph presentations, while the control group did not. The former gained 137 per cent in vocabulary over a period of six weeks while the control group gained but 73 per cent. Further, the slide group was able to compose far more correct sentences than the control group. Beglinger remarked that it seemed entirely clear

1. Freeman, Frank N., editor, Audio-Visual Instruction, Chicago: University of Chicago Press, 1924, 229 ff

2. Ibid., 342 ff

that the group taught with stereographs and slides had a great advantage in this experiment in teaching oral English to foreigners.

A series of projects in which slides were made and used by teachers in the intermediate grades were summarized by Vauter.¹ In one of these studies a group of average children were taught a spelling lesson presented with slides. Each word was presented on a slide with a child's name; this student spelled the word aloud and the group wrote the words after each was projected for ten seconds. The words were then corrected and it was found that the whole class missed a total of just two words.

In the same summary a project was described in which a grammar class was divided into two sections according to intelligence quotients. The group with the higher scores was instructed in the usual fashion, whereas the group with the lower scores was taught the same lesson supplemented with slides. Both groups received the same test; the results showed the low group to have scored 28.7 and the high group 30.8 of a possible 50 points. A testing of retention indicated that the low group could answer 18.5 questions correctly while the high group could answer 19.4 questions. There are two significant findings in this project: First, the body of students who were selected as having the lower intelligence quotients did not fall

1. Vauter, Sibyl, "Varied Uses of Slides in Intermediate Grades," Educational Screen, 21: 178-79, May, 1942

appreciably below the higher group on the immediate recall test. Secondly, they actually forgot less between the two tests than did the high group.

A third item listed concerned a social studies class in which two mentally equivalent groups were selected. One group studied a lesson with slides and other visual aids in addition to the text-oral instruction which the control group had. The former scored 82.5 per cent and the latter 70 per cent.

Vauter also told of a reading class consisting of two equally slow groups of pupils which was taught the story of Hiawatha; one group used slides while the other group did not use them. The children were then instructed to finish reading the poem. All pupils of the first group read the complete assignment, but an average of only one-third of the poem was read by the group which did not have the benefit of visual instruction.

This report does not include all of those studies Vauter summarized. Similarly favorable results were mentioned in a study of safety education and additional mention of successes was made in the areas of social studies and grammar.

A report by the United States Department of Agriculture states that many subjects can be taught with slides in less time than with lecture and blackboard methods. It is added that these slides are especially popular because of their ease of use and production.¹

1. What Research Shows About Visual Aids, U.S. Department of Agriculture, Extension Service, 7

An area which has not been mentioned thus far is the study of arithmetic. Zyve¹ conducted an interesting research problem in which she observed the learning of arithmetic combinations by a group of second and third grade children. She noted that two days of instruction with slides was equivalent to three days of instruction with the lecture and blackboard method. On the second day the experimental slide group scored 75 per cent and the control group scored 60 per cent. The final tests after a week's work showed results of 90 per cent and 57 per cent, in favor of the slide taught section.

Some Considerations of this Study

If slides are valuable aids in teaching in such a variety of areas the need for their use becomes pressing. Yet it would appear logical to question this need in several regards. Are other types of aids already available? Is there an adequate supply of slides on hand at the present? It is known that in some areas of instruction, aids of this nature are not aids at all--will slides hinder learning? This study was undertaken in an effort to evaluate the practicality of a program of teacher production of two by two inch photographic slides to be used for instructional purposes and to report upon a production plan, if the need appeared to exist. To report on this problem and in an effort to resolve it into a useful educational tool, this paper has been set up in the following manner: Chapter II will consider in

1. Zyve, Claire, "An Experimental Study of the Teaching of Arithmetic Combinations," Educational Method, 12: 16-18, October, 1932

detail many of the facets peculiar to this problem and tentatively suggest questions which must be answered if success is to be assured. Further, a method of gathering information which met the requirements of this particular study will be presented. One of the questions which will be raised concerns the feasibility of teacher production of two by two inch slides; this area will be considered in Chapter III. A fourth chapter will be necessary to consider the qualities desired in effective aids of this type, and a working plan for production will be presented as a culmination of the effort in Chapter V.

CHAPTER II

THE PROBLEM AND THE METHOD

In this section the motivation for this study will be discussed from several viewpoints including: supplemental learnings available to the students, advantages to the teacher, the supply of slides commonly on hand as related to the needs, and the status of available information on teacher production of slides.

It is not anticipated that this report will present a "panacea" for even a small portion of the problems which confront educators today. The thought is not harbored that other programs in use throughout the visual aids field will be suddenly found to be obsolete or misguided. A sincere effort has been made to present a purely objective analysis of an area which may in some way contribute to the more efficient instruction of the students in today's schools. A preview of this study convinced the writer that a program of slide construction could benefit students and teachers in many ways.

Advantages for Students through Local Slide Production

In modern schools it is recognized that aspects other than subject matter comprehension are also important in preparing students for life. Imperative to the effectiveness of this study's application is that in every possible instance the pupils will be given an opportunity to take an active part in the construction of slides of their own. It is common in up to date schools to think of the teacher as a person

who guides and directs the activities of the student in order that he may learn more successfully. While the context of the paper refers to teacher construction of slides, it must be borne in mind that in many cases it is most desirable for the student to do the actual construction with the teacher acting only in a supervisory capacity. It is hoped that the reader will keep this in mind throughout the remainder of the study.

The background of the students is of primary importance when new words or concepts are presented. When their foundations are not adequate the ideas presented are empty of meaning, and that educational blackguard, verbalism, has free reign. The teacher is in an excellent position to determine the character of past experiences, when concrete aids to learning are needed, and the exact form which they should take. A teacher-constructed aid would have an advantage over one commercially produced in that it could be made for a specific purpose at a given time, while commercial materials must be general in nature so as to be in wide enough demand to be economically feasible.¹ Locally produced materials can readily be made to fit the pupil level and to serve immediately the needs indicated by diagnostic procedures. They are easily adapted to supplement the available supply with special emphasis placed as desired. This procedure allows the teacher to draw

1. Hoban, Charles F., Jr., "Obstacles to the Use of Audio-Visual Materials," Audio-Visual Materials of Instruction, Forty-eighth Yearbook N.S.S.P., Chicago: University of Chicago Press, 1949, 54-59

upon his full experience and knowledge to help the students in the light of their peculiar requirements.

Pupils may receive many helps from the use and construction of slides within their own domain. It is an accepted principle that learning must be well motivated if optimum results are to be obtained. Dent¹ claims, "The making of photographic lantern slides is a most fascinating and yet a rather simple process. In many cases advanced pupils derive much pleasure from this type of work and produce excellent results." Angell² concurs, saying that slide making with children provides a thrill of accomplishment. She warns that all pupils must be given an opportunity to participate. This point is also brought out by Skelly³ who maintains that the crudest child work is of more interest to him than the best art in the world. She lists the values of making slides as:

1. It is stimulating and can be used to arouse interest in other areas.
2. Development of techniques.
3. An incentive for good diction and better speech.
4. Development of dramatic ability.
5. Imparting essential knowledge.
6. Direction of energy to high standards of accomplishment.

1. Dent, Ellsworth C., Audio-Visual Handbook, Chicago: The Society for Visual Education, Inc., 1937, 58

2. Angell, Della M., "Making Slides in Elementary School," Social Education, 3: 122-24, January, 1939

3. Skelly, Edna Moore, "Pupil-Made Slides to Integrate Activities in Elementary School," Educational Screen, 25: 565, December, 1946

The opinions of Leder,¹ Curry,² and Clark³ can be summarized by saying that the pupil derives much satisfaction from seeing his work profitably used, and that he is highly interested in the related study and planning. Leder lists the following accomplishments of slide making activities: socialization through conferences dealing with planning the subject of the unit, the wording of the dialogue and the make up of the slides; gains in research techniques from the collection of information; practice in planning and organizing the scenes; increased skills of construction of models and understanding pictorial and graphic representation; and better understanding of map making and color harmony.

The Pasadena Public Schools⁴ published a most realistic pamphlet in which it is stated that several important learnings can be derived from locally produced materials, including: helping the pupils acquire the ability to work with others, share materials and ideas, and develop tolerance of ideas and opinions of others. Further, it requires and develops the ability to think through a problem and plan the production after organizing information into a logical order of presentation.

1. Leder, Jon P., "School-Made Kodachrome Slides Units," Educational Screen, 22: 126-7, April, 1943

2. Curry, F. B., "Youngsters Make Their Own Slides for Study," Texas Outlook, 34: 19, February, 1950

3. Clark, Ella, "We Make Them Ourselves," Educational Leadership, 2: 66-68, November, 1944

4. Audio-Visual Education in the Pasadena Secondary Schools, Pasadena City Schools, Publication 16, 1948, 49, 76

It helps students learn to correlate materials from several sources. The imagination and creative expression are stimulated. The development of a sense of audience responsibility is included along with a recognition that work done would receive due credit. The study concludes, "... and motivates by its realsticness and by connecting the school and the out of school...."

Moore¹ reports, "Our experience in using this form of visual aid convinces us that it is one of the most desirable means of motivating learning." The benefits of study analysis and recall for organization of meanings, self-initiated topics and purposeful sharing in presentation with consequent aiding of fluent expression are also brought out.

Advantages of Slide Production to Teachers

The considerations which have been enumerated above tend to show that pupils may receive many advantages, directly and through supplemental learnings when a program of slide construction is carried on within the classroom. This alone would make such a project worthwhile. However, other factors are present which will point out to the teacher certain aids which he may obtain in carrying out his program.

Before a good slide can be presented, a great deal of planning must be done and in the process of doing this, concepts will be cleared up for both the students and the teacher, enabling them to

1. Moore, La Venne, "Adventures in Learning Through Pupil-Made Lantern Slides," Educational Method, 18: 32-33, October, 1938

solve many of their own problems with a minimum of difficulty. In describing the production of color slides, Bierwert¹ remarks that the teacher is in a marvelous position to correlate the curriculum through the medium of slides. The use of slides in presenting information can aid the teacher in that drawings, charts, and graphs become large enough to be seen by the whole class when projected as slides. There is no problem of repeating a diagram in a form similar to a previous illustration as the original slide is re-used. The difficulties of insuring neatness and accuracy in the presentation diminish; the lesson is more interesting and encourages the pupils to follow the discussion more closely. There is less effort by the teacher, and of vital consideration, slides are economical with a teacher's time.

Of further importance to teachers is the possibility that a program which depends entirely upon commercial materials may not be able to produce a specific type of slide at the precise time when it would be of most value. It is also very likely that from time to time it will be found that the particular slide which is needed simply does not exist. Locally produced materials can readily be made to fill the exact requirements and will be on hand whenever the producer desires their use.

1. Bierwert, Thane L., "How to Produce Color Slides," Nation's Schools, 37:58, June, 1946

It is well to remember that many areas of vital local interest would surely not be covered by available commercially produced aids as they would not be of such concern to others. However, the immediate locale of the producer could be made to function as an active, integrated part of the school program, and assist in relating the education of the school to the life of the community. Under proper guidance learning would be more functional and community relations strengthened.

While attention has been directed toward the many advantages of a program of slide production within the school it is not to be inferred that this is to eventually oust commercial slides, nor to replace all other audio-visual aids. The ultimate objective of local production is to supplement the available aids as the need arises, in a purposeful, creative, instructional manner. Surely this is a worthy goal.

A Similar Study of this Problem

A study similar to this one was carried out in San Jose by Palmer¹ in 1948 and put into use following its completion. As a preliminary survey two hundred teachers were interviewed to determine if elementary teachers were interested in making use of this area of the visual arts field for their own purposes. It was found that 165

1. Palmer, C. W., "It's a Snap for San Jose Teachers," Educational Screen, 27:15-16, January, 1948

teachers were interested in the project, 134 thought that it would be of value to them, 178 could use the procedures and methods if they were made available, and 169 were presently making use of projected materials. It is difficult to explain the differences in the second and third replies as they would seem to imply similar conditions; however, the program was obviously desired by a considerable majority in either interpretation. The reasons given by the teachers as influencing their replies were: lack of time to get materials on hand organized, lack of mechanical facilities for projection, not enough material on their particular level, no material in the field, materials on hand outdated, and materials not organized, vague or in use elsewhere.

As a result of the study it was deemed desirable to set up a program in which the school would furnish materials and equipment; the master copy of the completed slide was placed in the visual aids center while subsequent copies remained with the teacher who produced them. An in-service program was developed to familiarize the teachers with the procedures involved, the materials already on hand, and to encourage them to plan filmings while preparing units.

Although a need for a program of teacher construction of two by two inch projection slides was present and a successful project carried out by one group has been presented in brief, the literature pertaining to producing slides specifically designed to fit teaching

situations was found to be extremely limited. It appeared that two general areas were presented: the technical writings by and for professional or skilled amateur photographers and the general considerations given in educational sources. The former are typically technical, requiring more knowledge of photography than most teachers are likely to possess. The latter are so general in nature that it is impossible to follow them through to a successfully completed slide which will be useful in the classroom. It was the writer's conviction that these limitations made a study in this field pertinent and necessary.

Further Questions this Study Must Consider

There are several questions which must be answered to enable one to critically follow through a report such as this. The first two areas have already been considered and generally favorable results have been obtained. The first was a brief analysis of the value of slides in teaching a variety of subjects; the second concerned the relative advantages of locally produced materials. It was concluded that at present no satisfactory program for teacher construction of two by two inch projection slides has been outlined, or at least, one was not discovered even after an extensive survey.

While it appeared reasonable to assume that a project should be undertaken in this field, there were other factors which had to be evaluated. The feasibility of teacher construction of slides

required investigation before further progress could be made. It was necessary to consider the results obtained by others who had attempted the task and to weigh their advice as to desirability of the project, results which might be expected, the difficulties involved, and the costs which must be met.

When favorable results were obtained from the questions above, one could then proceed to outline a course of action. An analysis of qualities necessary for successful slides was known to be a vital section. The techniques of production and the needs for further study were then considered.

Topics which the remainder of this report discusses are:

1. Is teacher production of two by two inch projections for instructional purposes feasible?
2. What qualities are desirable in teaching slides?
3. What are the most practical techniques of slide production?
4. What are the conclusions and recommendations which may be made as a result of this study?

The need for a study such as this has been pointed out and the general form which it should take has been indicated. In order to arrive at the goals which were set up, three sources of information were pursued.

The Sources of Information

An original source of information was that of the manufacturer of photographic and projection materials and equipment. Through

these individuals it was possible to gather information concerning the materials available and the recommended procedure for usage from those most clearly in a responsible position. Letters asking for information on their products were sent to several manufacturers, most of whom responded in a cooperative manner. A sample of the correspondence sent out may be seen in the appendix, also a list of firms contacted and the general nature of the reply received is included. This particular source of information served to identify the resources available, a necessary step in organizing the project.

As stated previously, a considerable amount of writing has been done on the general subject of the construction of two by two inch slides; however, in very few cases have these techniques been related to the psychology of learning, or to the limited facilities with which teachers are likely to be working. In this study an effort was made to correlate these factors. Individually these writings did not fill the need; however, it appeared that a synthesis of them would prove to be of value. By melting down the material available and skimming off the top quality information for a specific purpose, one may often obtain worthwhile results. Good, Barr, and Scates¹ vouch for this type of research. They state, "The historical method

1. Good, Carter V., A. S. Barr, and Douglas E. Scates, The Methodology of Educational Research, New York: Appleton-Century-Crofts, Inc. 1941 224-25

is considered a major approach to educational truth.... Analytical works of a bibliographical and summary nature may well be classified under this heading." It is further mentioned that critical summaries require research ability of a high order; if the work of analysis and synthesis is well done, a valuable contribution to educational literature results.

This procedure allows one to observe the present situation, to criticise and evaluate it. Through these steps useful generalizations are formed, discarding the irrelevant and organizing the pertinent. In this manner it is possible to profit through the experiences of the past, to throw off the yoke of complacency brought about by absorption and satisfaction with present methods.

A third source of information for this study was the first-hand experience gained by the writer while attempting to make use of the knowledge acquired through the two channels mentioned above. This took the form of an actual effort to put into practice those procedures outlined by the other sources. Unfortunately, in this phase of the study there may arise a criticism of allowing subjective judgments to enter the study. This step was necessary, however, if the writer was to report upon the success or failure of this effort to arrive at a working pattern for teacher made slides. A partial compensation is the fact that no effort was to be made to claim superiority for one product over another; the purpose of the study

was only to report upon the techniques involved. This was done in terms of the quality of results obtained, difficulty of the method, and expenses involved.

Throughout the complete report every effort has been made to conform to the standards set up by the National Committee on Research in Secondary Education as reported by Whitney¹. This demands:

... (a) accuracy, objectivity, and quantitateness; (b) reliable and relevant data; (c) valid standards of comparison; (d) a determination of the relationship of time, place, and cause; (e) accurate and adequate description; and (f) great care in interpretation and in the formation of conclusions.

Organization of the Remainder of the Study

To be of consequent utility the results of the three types of investigation carried out had to be in terms of equipment and materials available to the teacher who is not a specialized amateur photographer. Further, it was deemed desirable to present adequate, but in-so-far as possible, non-technical information of a nature which would insure maximum utility. To accomplish this end, Chapters IV and V present a working pattern for evaluating and constructing slides respectively. This approach serves to review the information on hand, bringing the weight of many authorities to bear, and allows an evaluation of those qualities and techniques which are considered

1. Whitney, Frederick Lamson, The Elements of Research, New York: Prentice-Hall, Inc., 1942, 171-72

essential by the majority of them. It also has the advantage of culminating in a useful pattern of recommendations.

In Chapter III the general method outlined above is used to help determine the feasibility of teacher production of two by two inch projection slides. The experiences of others are observed; this tentatively solves the problem of practicality, although the final analysis must await the conclusion of the report.

CHAPTER III

THE PRACTICALITY OF THE PROBLEM

However desirable a plan may appear, it cannot solve any immediate problem if it is incapable of being put into operation with a minimum of delay. It was the purpose of this study to investigate a possible solution to certain phases of a current instructional problem. High quality materials must be made available when they are needed and at the least possible cost. If the costs involved in teacher-constructed slides were too high, or if the mechanics involved were too technical, this method of production would not be feasible. To enable the reader to evaluate these possible difficulties complete reports are given, whenever possible, of all expenses for materials and equipment used, or suggested in this study; to judge the labors involved in actual production one may turn to the working plan outlined in Chapter V. Many writers have stated their opinions as to the usefulness of teacher-constructed slides; it will be of interest to this study to observe the general trends.

In Visualizing the Curriculum, Hoban, Zisman, and Hoban¹ suggest that teachers refrain from making their own slides as there is

1. Hoban, Charles F., Samuel B. Zisman, and Charles F. Hoban, Jr., Visualizing the Curriculum, New York: Cordon Co., 1937, 160

thought to be considerable effort involved in making a technically good slide, a procedure commercial concerns are adequately prepared to accomplish.

Koon¹ expressed a similar caution, saying, "Mere local interest, however, is valueless if the films produced are poor in quality or limited in educational content." Surely the warnings of these authors must be kept in mind, particularly their emphasis upon the quality of materials which are to be used in the classroom. However, among all of the sources analyzed during the study, only the one presented above preferred to rely solely upon commercial productions, while the latter held this position only if equal quality was not attainable in the local productions, a condition which many others also demanded.

It appeared that a large number of writers did not feel that it was too difficult to obtain acceptable results. MacHarg² strongly advocated teacher construction of slides and uniquely stated his position, claiming, "Colored slides add so much to the efficiency of teaching that every teacher needs a camera for making slides, and a projector for showing them as much as a carpenter needs a hammer and saw!"

1. Koon, Clyde M., School Use of Visual Aids, Washington D. C., United States Government Printing Office, 1938, 45

2. MacHarg, John B., "Visual Teaching," The Encyclopedia of Photography, Vol. 9, New York: National Educational Alliance, Inc., 1943, 3480-90

Perhaps a recent study by Schroeder¹ will be of more interest through its numerical interpretation of the problem. It was disclosed that audio-visual directors throughout the United States considered the hand-made lantern slide to be the most valuable teacher-constructed aid, with two by two inch photographic slides following closely, having received approximately one and two-thirds times as many votes as the aid considered to be next in value. He concluded, "The persons responsible for the administration and coordination of the school audio-visual program, should encourage the development and use of locally prepared audio-visual materials.... The results of this study indicate that more emphasis should be given to providing teachers with experiences in constructing audio-visual aids."² The findings of Schroeder served to strengthen the contention that a program of slide construction within the school can and should be a valuable activity.

A major cause behind the need for such a program was brought out by Haas and Packer as follows: "You will soon discover, however, even though a large number of slide collections exist, the specific slide that you would like to use is not available or does not exist. Should you give up the idea at this point?" They answered their own question saying, "Definitely not. Most likely you can make the slide in your own classroom. Many youngsters in elementary school have

1. Schroeder, Marvin J., A Study of Teacher Constructed Audio-Visual Aids, Unpublished Master's thesis, Central Washington College of Education, June, 1950, 25

2. Ibid., 54-55

prepared excellent "hand-made" slides."¹ The problem of the non-availability of materials when needed can be effectively combated in this manner.

From the foregoing discussion it appears that some differences of opinion exist as to the feasibility of teacher-constructed slides. It seemed that several considerations should be included in evaluating this question. The time involved was a major consideration. If a prohibitive amount of time were required, slide making would not be a practical activity. Other factors of equal importance included the expense of materials and equipment, the results which could be obtained, and the impact upon the students. From a perusal of writings on this subject it was not difficult to ferret out comments on these problems.

Time and Effort Required in Slide Construction

McKown² was encouraging, saying, "An outstanding advantage of the 35mm. camera and the 2 x 2 slide projector is the ease with which one may photograph subjects of his own choosing and thus prepare a permanent library of strip films or 2 x 2 slides."

A similar finding was given by Schreiber³ who reported, "The

1. Haas, Kenneth B. and Henry Q. Packer, Preparation and Use of Audio-Visual Aids, New York: Prentice-Hall, 1950, Vol. 2, 37

2. McKown, Harry C. and Alvin B. Roberts, Audio-Visual Aids to Instruction, New York: McGraw-Hill Book Co., Inc., 1940, 130

3. Schreiber, Robert E. and Leonard Calvert, Building an Audio-Visual Program, Chicago: Science Research Associates, Inc., 1946, 20

availability of 35mm film and miniature cameras makes possible, also, production of passable slides by the school itself to fit an individual situation."

An important opportunity for teachers to make use of their own facilities are vacation times when they may obtain pictures of many things. This point was emphasized by Kinder¹ who remarked that alert teachers who have their cameras with them on vacations may come back with the finest type of teaching materials. Dorris² expressed the same thought mentioning that some of the most valuable slides used for classroom instruction have been made from Kodak negatives taken on field trips and vacation excursions.

None of the sources observed indicated that the time and labor involved were serious deterrents, while one went on to say that even elementary pupils could turn out satisfactory work. Certainly this first consideration did not pose as a threat to a program of teacher construction of slides. Even though the slides can be produced, their value is directly determined by their reception in the classroom.

Clark³ stated that some of the most valuable lantern slides were being made in classrooms by students and/or teachers as the need for them arose. The production of visual aids in the classroom is

1. Kinder, James S., Audio-Visual Materials and Techniques, New York: American Book Co., 1950, 173

2. Dorris, Anna, Visual Instruction in the Public Schools, Boston: Ginn and Co., 1928, 165

3. Clark, op. cit., 66-68

advised by McClusky¹ also. To quote him, "The best audio-visual aids develop out of classroom experience.... Teachers should be encouraged to create audio-visual aids. Professional service of the highest sort may be rendered in this manner."

The Impact of Slide Construction within the Classroom

The use of visual aids which have been constructed in the classroom seems to have a desirable motivating effect upon the students, during both the immediate project and later associated studies. Clark² stated that pupils experience considerable satisfaction in being able to present their points clearly and emphatically by using visual aids which have been prepared for their own purposes. Leder³ expressed a similar thought saying that in his school, slide construction has proven to be an unparalleled motivating force.

Among the literature dealing with the reception of a slide program by the students there was found no instance of unfavorable comment: those reported above are typical. It is apparent that from this standpoint slide construction projects are highly desirable.

The Costs Involved in Slide Construction

A last area of consideration concerning the feasibility of the program is that of costs. A problem which constantly confronts

1. McClusky, op. cit., 99-100

2. Clark, op. cit., 66-68

3. Leder, Jon B., "School-Made Kodachrome Slide Units," Educational Screen, 22:126-27, April, 1943

educators is that of attempting to utilize limited financial resources in the most efficient manner. During the 1951 session of the legislature of the state of Washington, a great deal of discussion centered around means of economizing within the educational system. There were numerous criticisms leveled at the schools in general, concerning excessive spendings, "frills" and the like. It is not the purpose of this paper to discuss the above charges; it has been proved to the satisfaction of educators that the ways which were "good for my father" and "good for my mother" are not necessarily "good enough for me". However, regardless of the attractiveness of an apparently excellent activity it must be judged not only in terms of optimum educational experiences, but also in terms of relative economy. Thus, consideration was given to the expenses involved in teacher construction of two by two inch projection slides; it was an important phase in the analysis of this study's practicality.

The Temporary Guide for the Instructional Materials Program¹ published by the office of the Superintendent of Public Instruction of the state of Washington gave further impetus to the acceptance of teacher-constructed slide projects as a practical procedure. It suggested that slide sets be augmented by photographic copying of useful materials from books, magazines, and other sources. The cost per slide was said to be surprisingly low; local slide production

1. A Temporary Guide for the Instructional Materials Program, Office of the Superintendent of Public Instruction, 1950, 24

was found to be highly effective when done by students and teachers who sought out subjects worth photographing and added their results to the school's collection. Provisions to furnish film to these field operators was mentioned as a possible profitable budget item.

The amount of money which would be necessary in such a budget is not large. Miles and Spain¹ commented upon it as follows:

Another illustration of a simple device which has great potentialities is the 2 x 2 inch slide. A minimum amount of equipment and money is required for exploitation of this medium. Pictures may be taken locally and the slides then produced commercially at little cost, or the teacher and pupils with proper equipment can construct these slides in the classroom.... improvement of instruction through the use of a variety of instructional materials can be effected by local ingenuity and initiative.

Alyea² made note of the large saving which may be made by local production, thus fitting it ideally to the limited budget. Winsey³ also mentioned the inexpensiveness and comparative advantages of this type of teaching aid.

While it is impossible to determine the feasibility of a program such as the one advocated in this report to the satisfaction of all readers for all time, it would seem logical to argue that the evidence which has been discovered would justify undertaking such an activity under existing circumstances. In the preliminary chapters the back-

1. Miles, John R. and Charles R. Spain, Audio-Visual Aids in the Armed Services - Implications for American Education, Washington D.C.:

2. Alyea, Hubert N., "Lantern Slide Techniques," Journal of Chemical Education, 16:308-12, July, 1932

3. Winsey, A. Reid, "Art and the Small Color Slide," Educational Screen, 24: 398, November, 1945

ground of the problem was presented along with the advantages which it seemed to possess. In this chapter a brief, but objective, analysis has been made of certain areas which would be important in determining its practicality. It was found that the majority of writers favored teacher construction of two by two inch slides. There did not appear to be a serious deterrent to the project: the costs and technical problems involved were not found to be hinderances; the effort and time required to produce favorable results were not unreasonable, and the reception which such slides could be expected to receive in the classroom would be most rewarding.

The results of this chapter show that utilization of teacher-constructed photographic projection slides would be a rational course of action which should prove to be of considerable value. To arrive at a functional working plan for slide production requires that one know precisely what is necessary and what is expendable, or desirable and undesirable, in the finished product. To further familiarize the reader with these requirements, Chapter IV will report on results obtained while investigating the question, "What qualities are desirable in teaching slides?"

An enthusiastic comment by MacHarg¹ will serve to summarize the findings of this section:

1. MacHarg, John Brainerd, "Of Lantern Slides and Me," Educational Screen, 19: 231-33, June, 1940

It is now the business of my life to make teachers and everybody else realise the joy of color slides. It is hard for me to restrain my enthusiasm. The educational possibilities of these slides are such that revolutionary advances in teaching seem to me immediately before us--
..... Almost anyone can learn to make color slides of almost anything in the heavens above or the earth beneath. To miss their help and indescribable beauty would mean for me, the loss of one of the greatest satisfactions of life.

CHAPTER IV

GUIDES TO PRODUCING EFFECTIVE TEACHING SLIDES

The preceding chapters have discussed the need and practicality of a program of slide construction in the classroom. If such a program is to be developed there must be an acceptable guide for production available to teachers. From a review of information pertinent to this field it was possible to observe the adequacy of the present sources and to synthesize these into a more usable form. From an analysis of this literature it was discovered that two general areas were represented. These were considerations on composition as shown by research in the psychology of learning from still pictures, and the physical qualities necessary to assure good teaching slides.

When Slides are Needed

Some of the implications of the research carried on by Freeman¹ and others at the University of Chicago were pertinent to this study. A primary goal of Freeman's project was to discover the relative effectiveness of various methods of presentation of several types of lessons. One result with many ramifications was brought out time and time again; it was found that the effectiveness of a teaching method depended upon the nature of the instruction to be given, and the characteristics of the previous experiences of the group. One type

1. Freeman, op. cit., 69 ff

of picture method proved superior for teaching one type of lesson while another method was superior for other acts. Pictures were found to be an invaluable aid in getting certain concrete experiences. If the past experiences were adequate the oral method of instruction was as effective as others; however, if the past experiences were not adequate, pictorial methods proved superior. Still pictures were generally as effective as motion pictures if motion was not an important phase of the concept. Language was found by the investigators to be a necessary accompaniment of concrete experience. This would indicate that slide instruction with oral discussion carefully planned would be more effective than a silent presentation.

From observation of Freeman's findings it was possible to arrive at some general conclusions: The need for enriched instruction is present if the background of the children is inadequate for the understanding of the concepts and words to be presented. In many cases pictorial instruction is an invaluable aid in doing this. Carefully prepared dialogue should accompany slide production. Slides are not well suited, compared to moving pictures, if the concepts involve motion; however, they are particularly useful if lengthy group observation is wished for any picture.

Unfortunately a large amount of research remains to be accomplished before a paragon can be established for correlating the psychology of learning and the mechanics of material planning and

construction for educational purposes. To make the situation more difficult there is inadequate use of what knowledge is available at the present. Dale¹ expressed this as follows: "There is a great gap between known information on perception and its application in instruction through audio-visual techniques."

Children's Preferences for Slide Types

Even though this lack of application has been present in the past, a considerable amount of information can be secured by studying results of research projects which have been completed. Malter² summarized the results of several studies of children's preferences of illustrative materials. The majority of the experimenters found that children preferred colored to black and white materials. The younger children preferred saturated color, while increasing age and the liking of softer tints and tones were directly related. It was concluded that children like pictures with story telling qualities which are brought about by interaction among the details of the composition. Although children were interested in a wide variety of subjects it appeared that silhouettes were not a popular choice. With these findings in mind it was stated that the subject matter of teaching pictures need not be restricted. Malter concluded that it

1. Dale, Edgar, James D. Finn, and Charles F. Hoban, Jr., Audio-Visual Materials of Instruction, 48th Yearbook, Part 1, NSSE, Chicago: University of Chicago Press, 1949, 254

2. Malter, Morton S., "Children's Preferences of Illustrative Materials," Journal of Educational Research, 41: 376-85, January, 1948

remains to be seen how much children's preferences should be considered in making selections.

One of the studies summarized by Malter was performed by Williams¹ at the University of Chicago. She maintained that one must know the natural likes and dislikes of children if a successful program were to be initiated which would capitalize upon these interests. She summarized her findings by saying that a majority of children like the same pictures; they like pictures of places, people, and incidents which are familiar to them. Although there is some interest in pictures of children this has probably been exaggerated, according to Williams. If children have read or heard something about a picture it stimulates appeal toward it; those with a few large easily distinguished articles in the foreground were preferred. Evidence was found that children take pleasure in identifying themselves with the subject of the pictures. It was noted that there was a need for further research to determine more definitely the types of pictures preferred by children.

Mendenhall and Mendenhall² reported that in a study of children's preferences for pictures it was found that children expressed distinct preferences relative to certain pictures, and that these preferences

1. Williams, Florence, "An Investigation of Children's Preferences for Pictures," Elementary School Journal, 25: 119-26, October, 1924

2. Mendenhall, J. E. and Marcia E. Mendenhall, The Influence of Familiarity upon Children's Preferences for Pictures and Poems, Lincoln School Research Studies, New York: Teachers College, Columbia University, 1933, from Dale, Finn, and Hoban, op. cit. 279

were intensified as the showings were repeated. Those pictures which appealed most were of a representative type, conventional in content, style, and color. Natural scenes were preferred to portraits and figures.

Black and White versus Colored Slides

Two studies of the effect on learning of colored as compared to black and white slides resulted in somewhat conflicting results. MacLean¹ found that of 152 boys there was a slight superiority in ability to answer twenty questions concerning the content of the pictures among the group which had observed the colored slides. He also stated that colored slides were superior in creating an illusion of distance and in enhancing existing contrasts. When architectural or engineering details were stressed colored slides were found to have less value. MacLean also found color useful to concentrate attention on a limited area of the slide and to convey the feelings of sunlight and warmth. Somewhat contradictory to these findings was the information given by Lewerenz² on his studies in comparing the information gained from colored and black and white slides. His

1. MacLean, W. P., "A Comparison of Colored and Uncolored Pictures," Educational Screen, 9: 196-99, September, 1930, from Department of Elementary School Principals, N.E.A., Aids to Teaching in the Elementary School, Washington D. C.; N.E.A., 1934, 435

2. Lewerenz, Alfred S., "The Educational Effect of Coloring Stereopticon Slides," Los Angeles Research Bulletin, 8: 8-13, October, 1938, from Ibid., 439

results showed that color was but 88 per cent as effective as black and white material, although children expressed a two to one preference for colored slides. Lewerenz concluded that the content of the slide was the important factor in presenting information to pupils.

It would appear that both color and black and white slides are effective in instruction. In some cases, of small details, color seemed to detract from the central regions, or it could be used to emphasize a specific area when this was desired. The way in which it is used appears to determine the value of color in slides.

Planning A Slide Making Project

In planning the development of a slide set, it is well to keep in mind the accepted concepts of learning, and to plan the set with them in mind. Of prime importance in preparing slides for classroom use is the setting in which the production takes place. Miller and Schenck¹ say that pupils' construction of slides gives opportunities for integration of related concepts. However, these projects must be kept within the range of the ability of the pupils, each having a task which is of interest to him. It is suggested that assistance and encouragement be freely given until the task is carried to completion. If the program is to be a success, critical judgment must be exercised in selecting subject areas.

1. Miller, Paul S. and Mildred Schenck, "A Case for Integration through Slides," Educational Screen, 18: 189-90, June, 1939

Advice is given by Beirwert¹ as to how subjects which are to be broadened through slide production may be analyzed. It is suggested that the subject be carefully thought through in terms of possible difficulties in understandings, and then these areas of difficulty investigated to determine where slides might be of value and the form which they should take. This will help guide the production, serve as a cross application to prevent duplication, and check on the pertinence of the photography.

Directly related to the remarks above are those found in the bulletin, Audio-Visual Education in the Pasadena Secondary Schools² to the effect that one should think concisely, and analyse the material to be presented through research, thought, and study so as to accurately transpose the verbal to the graphic. Fitzgerald³ outlines the planning carried through by one group. In a manner similar to the reports above, the first consideration was to set up and analyse the information which was to be presented, and from this process to note the problems which were to be solved. A shooting script was then worked out listing each slide and its unique contribution to the set. The photographers and settings were then arranged for and similar scenes photographed together.

1. Bierwert, op. cit., 58

2. Audio-Visual Education in the Pasadena Secondary Schools, Pasadena City Schools, Pasadena, 1949, 76

3. Fitzgerald, Lawrence, P., "We Made Our Own Slide Set," Educational Screen, 29: 69, February, 1950

Fern and Robbins¹ suggested a corresponding plan in which it is mentioned that the reasons and purpose of each illustration be carefully thought out, whether it is to be used as an introduction, summarization, or to develop a lesson. If the project is to be worthwhile the pictures must play an active part in presenting the subject adequately.

A publication of the Eastman Company, Kodak Data Book - Slides,² was prepared in the form of a handbook specifically designed to describe slide production. This source is the most complete of all those reviewed, although in certain respects it is somewhat technical, assuming that the reader has more knowledge of photographic processes than most teachers are likely to possess. The thought is presented that complete planning should follow a set pattern which would include: setting up the purpose, preparing an outline of the story to be told, evaluation with consideration for the audience to whom it will be shown, preparing a translation of word ideas into pictures, and making a file card for each picture telling precisely what it will show and the commentary to be used with it.

from the foregoing discussion it appears that there is general agreement among writers that slide sets must be well planned if they

1. Fern, George H. and Eldon Robbins, Teaching with Films, Milwaukee: Bruce Publishing Co., 1946, 104

2. Kodak Data Book - Slides, Eastman Kodak Co., Rochester, New York

are to be efficient, purposeful teaching devices. Also the type or form of planning seems fairly well established, although a certain source may have omitted a step or two which others deemed necessary.

Evaluation of Slides

The problem of evaluating the completed slide remains even though a most conscientious production procedure is followed. A survey of criteria for slide quality has two inherent values: to serve as checks while planning the production and to use in judging the slides when they are completed. It was found that several existing sets of requirements are available, one of which was listed by Hoban, Hoban, and Zisman¹ who said that good slides must have the following characteristics: truth, allowing no distortions or illusions; quality, including sharp photography, up to date materials, outstanding main topics, relevancy, pertinence to the topic, allowance for showing comparative sizes and excellence of mechanical qualities.

Nearly identical requisites were placed on slides by Losch² who states that slides should be of high technical quality and concern recent information analyses. She adds that they should be accurate and be of interest through close relationships to pupil purposes.

1. Hoban, Charles F., Charles F. Hoban, Jr., and Samuel B. Zisman, Visualizing the Curriculum, New York: Cordon Co., 1937, 160

2. Losch, Adela M., "Lantern Slides in the Classroom," Educational screen, 19: 279-82, September, 1940

Further limitations were given by McClusky¹ who remarked, "Above all else, audio-visual materials must be accurate and authentic. ... Attention must be directed to the significant points of interest unobstructed by unimportant details.... Relative sizes must be made clear."

MacHarg² insisted that slides to be used in teaching be materially good, that there be sharpness of detail and no blemishes. He added that care should be taken in cutting, binding, and mounting to insure pleasing proportions. The picture should be clear with brilliancy of focus and well balanced in an artistic manner with a definite center of interest. Contrast and color should be true. He went on to say that the picture must be truthful; the source must be checked if it is a copy, and if imaginative this must be clearly indicated. There should be no distortion; the camera should approximate the truth. The most useful pictures are those which are typical; any oddity should be labeled as such. If a scene is to be of maximum effectiveness, the motive should be definite and specific so as to present the dominant idea so strongly that it can be visualized; this is best done when no irrelevant details are allowed, and when beauty or allure is not a source of distraction from the main idea. A great deal of ingenuity is required to produce optimum results in the

1. McClusky, F. Dean, op. cit., 99

2. MacHarg, John B., "Visual Teaching," The Encyclopedia of Photography, New York: Nat'l Educational Alliance, Inc., Vol. 9, 1943, 3480-90

picture as a whole, or even in including some item which will show comparative sizes.

To further substantiate the above criteria Dale's¹ may also be cited: The picture must suit a specific teaching purpose and must give a true or typical impression. It must be good technically and artistically and must stimulate the imagination. To insure an accurate comprehension of relative sizes, at least one object of natural size should be included. Attention should be focused on one main idea; this can be aided by having the proper amount of detail, neither obscuring nor leaving bare any areas. And of greatest importance, the slide must contribute something to the pupil's knowledge.

A check list of questions which may be used to indicate qualities which Kinder² considers necessary in teaching slides included the following areas: Does the picture show the scene as one would see it on a visit? Is the composition simple enough to show the main points clearly? Does it present vividly what it portrays? Does it show, by relative sizes, comparisons with something which is known? Is natural action in a natural setting shown? Is the photography sharp and clear, the focus proper and the exposure correct? Is the picture artistic considering angles and color? Is it mechanically free from blemishes, smudges, scratches, and blurs? And finally, is the binding substantial and the caption adequate?

1. Dale, Edgar, op. cit., 232

2. Kinder, James F., op. cit., 170

An attempt was made by Trolinger¹ to obtain a set of standards for evaluating still pictures for teaching. She suggested two general areas of consideration, the technical and the instructional. Forty points were allotted to technical qualities as follows: artistic 11, clear and definite 11, practical size 7, properly colored 7, and lack of blemishes or other similar defects 5. The instructional qualities enumerated were: truthful and typical 15, relevant 11, stimulating 11, significant 9, authentic 8, and suggestive of actual size 6, making a total of sixty points. Trolinger found that with this score card teachers could grade more similarly to the evaluations of the slides given by a group of experts than they could without it. The teacher's evaluations with the cards correlated more closely with the judges' than with their own evaluations without the cards. Teaching experience and instruction in visual aids methods did not seem to make an appreciable difference.

The above discussion serves to point out the general areas which are considered important in quality slide production. For the most part there are few conflicts of opinion; however, it should be mentioned that some writers are more liberal in the quality demanded than others. Since some slides will be made from old materials,

1. Trolinger, Lelia, "Evaluation of Still Pictures for Instructional Use," Educational Screen, 18: 81-83, March 1939, 18: 116-17, April, 1939, 18: 157-59, May, 1939

McKown and Roberts¹ said that one should not be too critical, as in some cases the results cannot be expected to be too good. The importance of educational values over photographic perfection was stressed by Leder² who stated that originality and the use of pupil's materials were much more rewarding. McClusky³ contended, "Only material of the finest quality should be allowed in the classroom instructional situation."

A less mechanical rating questionnaire was given by Kinder⁴ in addition to those mentioned above. The questions included: does it enrich learning and will it enlarge the pupil's level of understanding? Are the facts shown authentic? Will the slide interest the pupils and raise questions? Does it present truthful situations, naturally and typically? Is the size of objects in the picture balanced and can an intelligent size comparison be made? Is color a necessary element, is it truthful and artistic? Will the slide evoke a wholesome emotional reaction? Is it free of mechanical defects, clearly marked and labeled? Will the slide fit into a series and unify the set? Will it add to the general significance of the set?

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1. McKown, Harry C. and Alvin B. Roberts, op. cit., 139
 2. Leder, Jon B., op. cit., 126-7
 3. McClusky, F. Dean, op. cit., 99
 4. Kinder, James S., op. cit., 172

The remarks above provide an extensive coverage of the many facets involved in slide production; although, in some cases it would appear that judgments of this type are forced to be relatively subjective. Obviously a great deal of overlapping is present among the suggestions given by the various writers, as would be expected. It was not the purpose of this report to embrace one series of criteria as the ultimate as it would be most difficult to show that one set was basically superior to the others. However, the general pattern of the recommendations is pertinent, in that it should present a type of consensus of opinion of a group of acknowledged experts in the field. This should supply a usable source of criteria for evaluating the completed slide, and routinizing the planning of slide production. As an aid in evaluating the frequency with which each quality was mentioned, Table 1 is presented. Obviously, all authors did not express those factors which they considered significant in the same manner. Therefore, it was necessary to group their suggestions according to the type of advice given. In Table 1 this has been done to facilitate the reader's evaluation; it was found that all requirements listed by two or more writers could logically be placed within one of the twenty-seven classifications listed.

A Summary of the Planning Procedures

In this chapter information has been presented concerning those characteristics which are combined to make a good teaching slide.

TABLE 1

QUALITIES DEEMED DESIRABLE IN TEACHING SLIDES BY A NUMBER OF AUTHORS

Quality	Number of times reported
Proper focus	11
Natural and typical	11
Shows relative sizes	11
*Lack of blemishes	10
Pertinent	10
Truthful	10
Close-ups to gain attention	9
Proper contrasts	8
Absence of background conflicts	7
Interesting to pupils	7
Oral comment included	7
Small groupings in setting	7
*Proper density	6
*Properly framed in mount	6
Artistic	5
*Properly exposed	5
Vivid portrayal of subject matter	5
Subjects not posed	4
Up to date materials	4
Inclusion of some familiar objects	3
Conventional in style	2
Conventional in color	2
Conventional content	2
Each slide fits into the set	2
Evokes wholesome emotional reaction	2
Appeals as a story would	2
Does not explain the obvious	2

* Not to be included in pre-filming check list.

In summary it would be well to consider briefly some of the findings of the research studies which have been reviewed:

1. Colored and black and white slides appear to be of somewhat equal value, in that no clear-cut advantage has been proved for one or the other. Color can emphasize areas and it can detract from, or obscure fine details.
2. In general, silhouettes were found to be unpopular; natural scenes were preferred to portraits and figures by pupils.
3. Pupils prefer pictures in which some familiar items are present whether they be places, people, or incidents, and those with story telling qualities or in which pupils can identify themselves with the subjects were of most interest.
4. Scenes which are natural, typical, and conventional are received better than are others.

The considerations above can best be incorporated through a complete, integrated planning program. While an individual would probably adjust a planning program to suit his particular needs after the first experiences, there is a common ground of agreement among most writers that the planning processes are a most important part of slide making. A pattern which seems to fit the needs indicated by a majority of the writers might proceed as follows:

1. Observe the subject matter to be presented and set up the purpose or objectives.
2. Outline the materials to be presented in terms of the above.
3. Think through the outline in terms of possible learning difficulties, where previous experiences will not be adequate to assure the pupils grasping the desired concepts or appreciations.
4. Check materials presently on hand, look into the possibilities of field trips and other first hand experiences.

5. Investigate the problem areas to see if slides would help the pupils gain the desired understandings. If they are to be used decide what general form they should take, keeping the audience in mind.
6. Through research, thought, and study, determine what specific points are to be brought out with each slide; have a reason or purpose for each slide to be made.
7. Prepare a concise shooting script. Include a description of the content of each slide along with the dialogue to be used with it.
8. Use Table 1 as a pre-filming check list.
9. Translate the word ideas into pictures. Group those which will have similar settings to be filmed together.
10. Prepare a file card immediately after filming to explain the source of material, the place of the slide within the set, technical filming data, and the commentary to be used with it. This would prove extremely valuable in cases of losses of individual slides from a set.

The purpose of Chapter IV has been to discuss the qualities desired in teaching slides. This has been accomplished through listing those qualities as indicated by writers in the field and through arranging a pattern for procedure which will be of value in planning slide construction. If the planning routine is carefully followed, and Table 1 is used as a check list before filming, the resultant slides are very likely to possess excellent instructional qualities. In Chapter V the photographic processes which are essential to filming the shooting script will be presented.

CHAPTER V

A WORKING PLAN FOR PRODUCTION

A preliminary study of the writings on instructional slide production indicated that individually they were not adequate as sources of information for teachers who wished to learn to make slides. By combining several sources and surveying the subject coverage of each, a check list and planning program have been established. The same process was utilized as a means to a comprehensive presentation of basic construction procedures. This chapter will serve to point out these techniques, and function as a guide to more detailed readings on specific topics which cannot be covered thoroughly in this report. The information presented in this chapter is an integral part of the plan for making educational slides, but it must be made to work in relation to the factors proffered in previous chapters; alone, the mechanics of slide construction are of infinitesimal value in the instructional sense.

The findings of the research carried on in this study indicate that rather definite rules may be set up to guide slide construction. It was found that there are two practical methods of slide production, the use of direct positive, and the transferring from a negative to a positive material. Each has distinct advantages which will become apparent with use. In general, the direct positive method was found to be much easier and equally effective when one is making slides of

ordinary outdoor and indoor subjects and when copying continuous tone subjects, that is, those which have intermittent shades between the lightest and darkest tones. The negative-positive method is best suited when one is working with line copies, those which have but one light and one dark shade. Most printed charts, graphs, and text would fall in the latter category. The former method will be discussed first, as in most work, other than the exception mentioned above, it will be the most valuable technique.

The Direct Positive Method of Slide Making

At the present time the use of direct positive film is quite limited. This disuse has been exaggerated because the producer, Eastman Kodak Co., has discontinued production of direct positive film in the convenient thirty-six exposure roll. Many dealers have little call for it and do not stock the larger quantities which are still available. It has been found that several dealers were not aware that this film was still available, and also that the belief is generally held that processing materials are no longer available. It is true that photographic laboratories no longer process the film, but the chemicals can be purchased from the Eastman Co. and the processing done by the slide maker in somewhat less than an hour. This technique was found to be the most economical of all those investigated; the cost of an unmounted slide is less than two cents.

The particular advantage associated with the use of direct positive film is just what the name indicates; a positive is the direct

result of developing the film which eliminates the sometimes difficult step of exposing a positive from the original negative. Table 2 lists the materials and equipment required in this procedure. The items listed in this section will include only those necessary for this particular step; binding materials and others will be listed as they are discussed. For added convenience approximate prices are listed, although these may change slightly or vary somewhat in certain areas.

If the scene from which the slide is to be made is a natural setting the slide maker has simply to load his 35mm camera with direct positive film, check the planning guide and quality check lists presented on pages 45 through 47, and prepare the camera for photographing. This step usually requires checking the focus, exposure time, framing of the picture, and cocking the shutter. These procedures are well known to most readers; if further information is desired it can be obtained from any camera shop. In many cases exposure meters are useful, although many experienced photographers feel that they are generally unnecessary. This is a problem which must be answered by the individual for himself.

Through careful planning a great deal of time can be saved by photographing similar scenes together. When this has been done, the developing procedures should be undertaken. The chemicals for processing direct positive film come in a package form, from which the solutions are mixed. Complete directions are included which makes

TABLE 2

MATERIALS AND EQUIPMENT FOR MAKING DIRECT POSITIVE SLIDES

Item	Approximate Cost	Source
35mm. camera	\$30. and up	photographic store
tripod	\$7.50 and up	" "
copying stand	\$0 - 150.00	home made or above
two #2 photofloods	\$.35 each	photographic store
soft reflectors	\$2 - 5.00	" "
supplementary lenses	\$2 - 100.00	" "
extension tubes	\$2 - 5.00	" "
mirror	\$.25	variety store
exposure meter	\$10 - 40.00	photography store
thermometer	\$1 - 4.00	" "
16 oz. graduate	\$.50	" "
daylight developing tank	\$2 - 10.00	" "
film weights	\$1.50 set	" "
developing trays	\$.40 - 4.00	" "
funnels	\$.30 - 1.00	" "
sponges	\$.35	" "
Direct Positive Film	\$7.90/100'	(by special order)
Direct Positive Developer	\$2.90/288 slides	(from Eastman Co.)

it unnecessary to discuss this step at length. Five powdered chemicals are used; each is mixed with a given amount of water and is then ready for use. It is well to label the containers clearly when mixing as they must be readily available in a specific order when developing. A daylight developing tank is particularly useful as each solution is poured into use in its turn; a developing tray for each chemical is not needed if a suitable funnel is at hand as each solution may be poured directly from its container into the tank. The most critical factor in this development process is the temperature of the solutions. A thermometer must be used to accurately gauge the temperature of each solution before it is used; if certain ones are too warm when used the film returns as a perfect blank. For the greatest convenience two rolls should be processed at one time.

The Use of the Copy Stand

If the subjects to be photographed include some copy work from books, magazines, and the like, some further considerations are of interest. A mechanical device is required to facilitate this copy work which will present a stable base and include lighting and focusing arrangements. Several commercial models are available which work very well. However, if one prefers to save this expense, a copy stand can easily be made with a minimum of equipment and materials. The expense is very slight and most satisfactory results can be obtained.

Flanders¹ cautioned that the copy stand must be sturdy and must allow free access to all camera controls. Davis² added that for best results, the materials to be copied must be kept exactly at right angles to the lens axis, and the lights which are used should be kept at forty-five degree angles to the plane of the copy materials. Figure 1 will make these directions more clear to the reader. The latter requirement eliminates many of the reflections or bright spots which would otherwise appear in the slide.

Although some writers designed copy stands in which the material to be copied was placed in a vertical position, these did not seem to be as generally acceptable as those which made use of the horizontal position. The reason for this becomes obvious when one considers that many of the subjects used are taken from books and magazines which must remain in good condition. It is much simpler to arrange for holding these items in position if they are to be laid upon a flat surface rather than suspended vertically during photographing.

Focusing for Copy Work

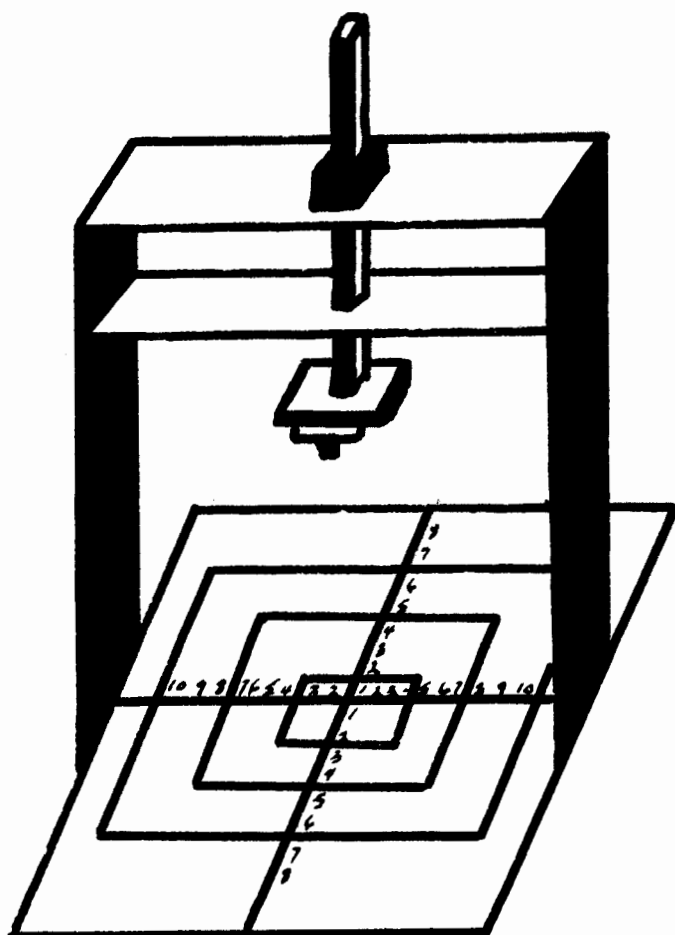
As the copy stand is being constructed, provision should be made for a set focusing system. Pierce³ warned that in copy work one must

1. Flanders, Mark J., "Two by Two Slides - and How!" Educational Screen, 25: 362, 364, September, 1946

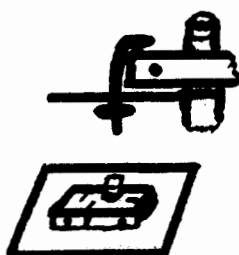
2. Davis, William S., Practical Amateur Photography, Garden City, New York: Garden City Publishing Co., 1937, 208-13

3. Pierce, Harry R., "Photographic Copying," American Annual of Photography, American Photographic Publishing Co., Vol. 56, 1942, 35-42

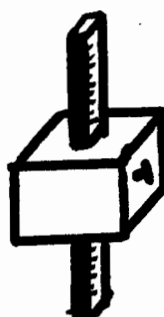
have the correct focus, and described a method for obtaining it with the least difficulty. A ground glass focusing arrangement is said to be most desirable, but a large number of 35mm cameras are not so equipped. If a regular roll film camera is to be used, one has only to remove the back from it and place a piece of ground or frosted glass in the focal plane. The shutter is then set at "time" and the shutter held open. By placing the material to be copied in position, a sharp focus may be obtained on the ground glass either by moving the camera or by focusing with the rangefinder. Obviously, this cannot be done before each picture is taken; however, if six or eight common settings are recorded on the copying stand one has only to fit the material into the proper rectangle, observe the indicated camera settings and take the picture. The rectangles can be painted or drawn on the base of the copy board and the settings for each determined by getting the subject area on the glass by moving the camera, and then getting a sharp image with the rangefinder. The place on the vertical shaft should be indicated, and note made of the setting for each subject area. This completely eliminates the need for focusing four out of five pictures as all negatives result in a two to three ratio between width and length allowing such sizes as: $4\frac{1}{2} \times 6\frac{3}{4}$, $5 \times 7\frac{1}{2}$, $6\frac{1}{2} \times 9\frac{3}{4}$, $8\frac{1}{2} \times 12\frac{3}{4}$, 10×15 , and 12×18 to accomodate the great majority of copy work. It must be remembered that the usual focusing and framing mechanisms cannot be trusted at these close distances unless



The scale is most useful in determining picture sizes and in lining them up. It can be marked-in with poster paint. The base should be dark to eliminate reflections. The rectangles are marked in to show the common settings of certain often used sizes. Corresponding marks should be made on the shaft. They may be distinguished by the use of varied colors.



Free access must be allowed to all camera controls.



Measurements must be from lens to subject. For convenience these can be marked on the shaft.

FIGURE 1

AN EASILY MADE COPY STAND

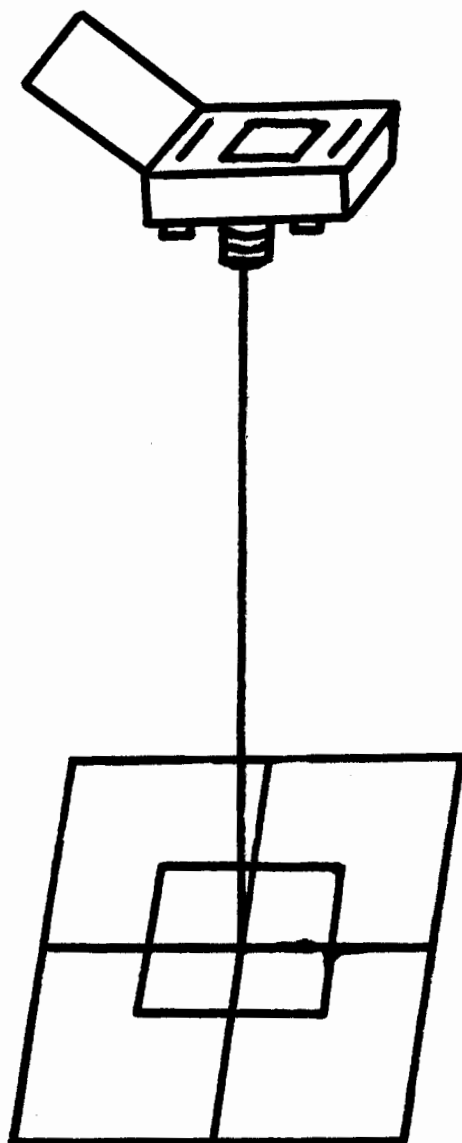
they happen to be of the ground glass type. By arranging a copy stand as shown in Figure 1, focusing can quickly be accomplished by use of scales and the charts for supplementary lenses.

If one should attempt to arrive at the proper focus settings for the above sizes it will quickly be found that unless a supplementary lens of some kind has been placed on the camera, the task is impossible. Ordinary cameras simply cannot do such close work without help. The most common procedures are to use extension tubes or supplementary lenses which may be purchased from most camera shops along with directions for their use. In the above procedure the additional lens material is put in place and the settings determined as indicated above.

As was mentioned at the outset, the foregoing discussion has centered around use of equipment which many teachers would be likely to have on hand, or could construct quickly and economically for themselves. Of course much more elaborate equipment may be purchased, and if one can afford it that is all very well. However, this study concerned itself primarily with those basic factors of slide production which would be allowed by a budget within a teacher's usual limitations. At the beginning the important thing is getting started; more advanced materials and techniques will readily be absorbed later.

Special Cautions to Observe During Copying

A wide range of materials may be copied with the set-up illustrated, however, there are some limitations. The Society for Visual



1. ground glass in focal plane
2. set exposure for time
3. cock shutter
4. depress and hold down shutter release
5. move camera as necessary to get whole image on glass
6. use rangefinder to get a sharp focus
7. repeat steps 5 and 6 as necessary
8. release shutter
9. record settings for future reference
10. obtain readings for various other sizes of material
11. mark-in settings for these common page sizes on the copy stand

FIGURE 2

ESTABLISHING THE PROPER FOCUS

Education listed the following requirements for materials to be copied for slides:¹ there should be no fine lines, folds or creases, half-tones should not be used, photographs to be copied should be of medium contrast printed on glossy paper, and copyrights should be respected.

Several other important considerations should be borne in mind. If the material to be copied is not exactly the correct size, it should be masked with black paper so as to show just that area which is desired. In this manner any material may be adjusted to show just the important areas, eliminating the extraneous. This should also be done to any pictures which are not of the ratio of two to three in width and length, to do away with masking difficulties when binding the completed slide.

If one is preparing drawings to be copied they should be made simple and legible; the lines should be heavy and clear enough to be seen from a distance of six times the length of the picture. Lettering which is to be used can be accomplished with the aid of letter guides, gummed paper letters or plaster letters. For best results white letters on a dark gray background should be used rather than black letters on a light background.

Certain difficulties may arise in copying specific materials. If typewritten work is to be copied a special carbon ribbon should be used, with white Bond paper and a reversed carbon. It should be

1. Visualize Your Message, Society for Visual Education, Chicago

double-spaced and cover no more than half a page. When photographing, this should be backed up with white cardboard. If the material to be copied has printing on both sides of the page, it must be backed up with black cardboard. Sometimes a rough-textured surface causes disagreeable "light spots" or reflections. To compensate for this, one should see that the lights are placed outside the extreme ends of the surface to be photographed so as to throw about twenty-five per cent more light at its edges than in the center. If this does not solve the problem, the subject may be covered with a thin layer of mineral oil or immersed in a tray of water. Of course, this measure may not be used with certain materials. If wrinkled or creased papers are to be used, they may be covered with a thin sheet of glass before photographing. Certain materials cause a reflection when viewed near the lens of the camera. Although the flood lights, number two size in soft reflectors, should be kept near a forty-five degree angle to the axis of the lens; sometimes moving their position a little will cause the reflections to vanish. In some cases the use of Pola-screens and lights are the best solutions. The fewest difficulties arise during focusing if one keeps the aperture as small as possible when photographic copying is being done, by taking the pictures at a relatively slow speed. For further specific difficulties including faded or dirty materials, colored ink and others, the reader is directed to the Kodak Data Book - Copying.¹

1. Kodak Data Book - Copying, Eastman Kodak Co., Rochester, New York

Copyrighted Materials

One should always respect the copyright on any material. In most cases, however, it is not likely that any infringement will occur if the materials are specifically used in schools for educational purposes at no profit. Unless it is so marked with the mark or symbol of the copyright holder in the margin, mount, or on the material itself, one does not have to worry about any copyrights. In case of doubt it is best to contact the publisher and obtain his permission for use.¹ A further caution must be taken as the law prohibits the copying of currency, stamps, government bonds, notes, identification cards, badges, insignia, and the like.

The Negative-Positive Methods of Slide Construction

Although the negative-positive method of slide production normally produces a more grainy result with poorer definition and requires much more effort than the direct positive method, it does have its particular uses. The direct positive method is not suited to use when making line copies, nor is it likely to be satisfactory when new copies of the same slide are to be desired from time to time. If the line copy is to be made from a print in which details are fine or somewhat indistinct, a continuous tone procedure would yield better results and should be used. The latter method brings

1. Smith, Robert Archer, "Take Pictures to Teach," Educational Screen, 28: 250-51, June, 1949

out details and emphasizes delicate shadings from dark to light while the line copies show extremes of contrast. If a single piece of copy material is to show both continuous tone and line work, one should proceed as though he were making a continuous tone slide, varnish the continuous tone area, and reduce the line copy section with a reducing agent such as R-4 and then intensify it.

To insure the extreme contrast needed in line copy work a process type of film is required. Unfortunately, there is no satisfactory single step method of producing this type of slide, but a negative of the subject must be made first. This is exposed in the same manner as the direct positive slide, using the same equipment and materials as listed in Table 2, with the exception of the film and developer. It is much more economical if bulk film is used in all processes, and with reasonable care to prevent finger prints, dust, or scratches from marring the film no difficulties are involved. In line work Micro-file film, a high contrast and fine grain combination, should be used. Other films such as Contrast Process Panchromatic, a sheet film, High Contrast Positive, and Plus-X may be used, the latter only in emergencies.

After exposure these films should be developed according to the data in Table 3. The negatives should then be washed in water or stop bath for thirty seconds and fixed in acid fixer for five to ten minutes. After final washing the negatives should be dried, but not cut from the roll.

The next step in production is the exposure of the positive film. The completed negative cannot be used in the projector as the light and dark areas would be reversed. Even though in some cases this would not be a serious handicap, negatives must not be used for another reason; they have not been treated for fire resistance as have the safety base positive films. Thus, the positive exposure must be accomplished, but with the least possible difficulty. Printing each negative individually would be an awkward and slow process. By use of a printing frame a mass production system can be established. As thirty-six exposures is a common number per roll of film the printing frame should be able to accomodate several negatives; nine, twelve, or eighteen are convenient divisions. The more frames exposed and developed without clumsiness at one time, the quicker operations will progress, and fewer materials will be wasted.

A Home-Made Printing Frame

Figure 3 shows a successful printing device. Some essential features of this item are: it must allow, and cause, perfect contact between the negative and positive films. It must not allow any stray light to enter the film area; to prevent this, close contact is maintained between the back piece and the sides, and the back is lined with black velvet. An arrangement must be made which will insure perfect allignment of the edges of the negative and positive materials.

TABLE 3

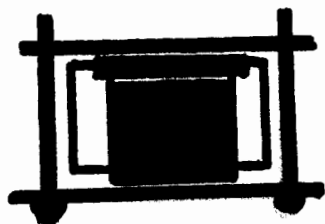
LINE-COPY MATERIALS AND DATA FOR THE NEGATIVE-POSITIVE PROCESS

To make the negative use	Develop in (68)	*Develop for (min.)	Fix in Kodak	Fix for (min.)	Safelight
Micro-File	D 11	4 - 5	acid fix	5 - 10	total dark
Contrast Process Pan	D 11	4 - 5	acid fix or F 7	10 - 20 3 - 5	total dark
High Contrast Positive	D 11	4	acid fix	5 - 10	Wratten 0A Wratten 1A
Plus X	D 11	4 - 5	acid fix	5 - 10	total dark
Anseo Process	D 11	4 - 5	acid fix	5 - 10	total dark

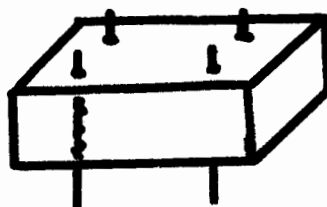
To make the positive use	Develop in (68)	Develop * for (min.)	Fix in Kodak	Fix for (min.)	Safelight
High Contrast Positive	Versatol, Dektol or D 72	2 - 5	acid fix	5 - 10	Wratten 0A Wratten 1A

* First figure applies if continuous agitation is employed, second figure if intermittent agitation is carried on.

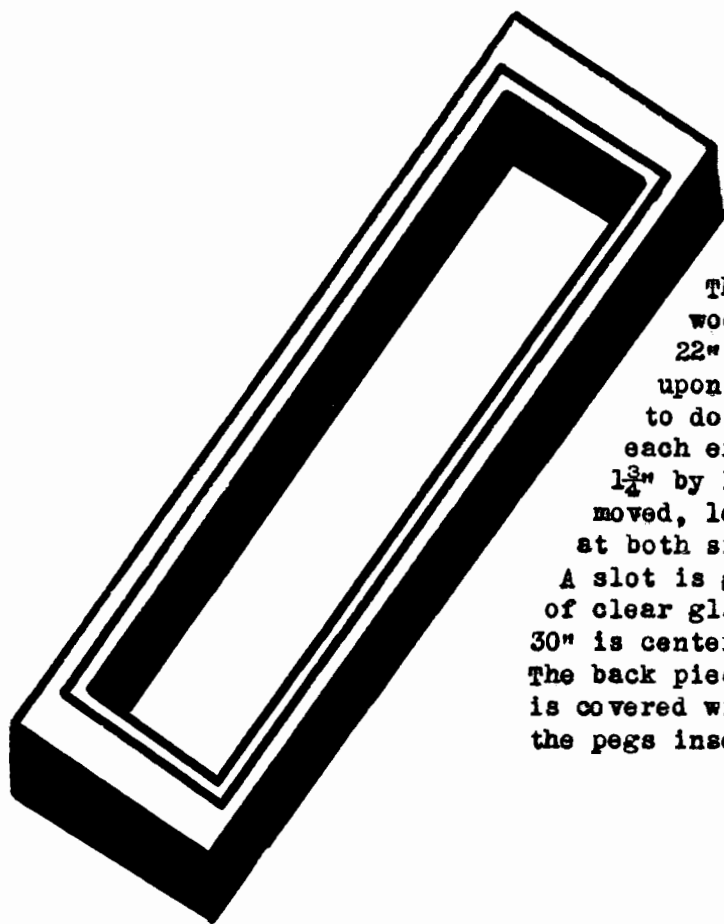
** Washing in cold, running water for thirty seconds should take place after development and before fixing. After fixing a thirty minute rinse should be given.



A method of insuring complete contact between the negative and positive materials. One metal clamp is used at each end.



The spaces for the holes are determined by laying an old negative in place. The holes should be about the size of a match stick. They slip out when the back is put in place.



The frame is made of wood. It is $3\frac{1}{2}$ " by 22" or 32", depending upon whether one wishes to do 12 or 18 frames at each exposure. A section $1\frac{3}{4}$ " by 19" or 28" is removed, leaving equal margins at both sides and both ends. A slot is grooved and a piece of clear glass, $2\frac{1}{2}$ " by 20" or 30" is centered-in securely. The back piece which was removed is covered with black velvet, and the pegs inserted, as shown above.

FIGURE 3
AN EASILY MADE PRINTING FRAME

In using the printing frame High Contrast Positive film is placed next to the negative. This step must take place in a room lighted only by an orange-red or greenish-yellow safelight. The emulsions, or dull sides, are placed together with the negative on top, or so it will be next to the glass of the printing frame. The films are lined up so the pegs from the backpiece pass through the sprocket holes; the backpiece is then slipped into place, the pegs forced out and removed and the clamping mechanism put in place. Experience will indicate the proper exposure for various conditions, but in general a time of four or five seconds exposure from a fifteen watt light five feet away is satisfactory. The positive film is next developed in Dektol, Versatol, or D-72, washed in water, fixed in an acid fixer for five to ten minutes, washed for about thirty minutes, and hung up to dry. After drying, the slide is ready for masking and binding.

Continuous-Tone Slides

A very similar procedure is employed for continuous-tone slides obtained through the negative-positive steps. Instead of the high contrast process films used in line work, a commercial type of film is used. This film is of low contrast and retains the delicate shades and details of the continuous-tone materials. An excellent film for this purpose is Panatomic-X; although, Plus-X can be used. With either film a normal, rather than a contrasty development is desired. For this purpose D-76 developer is used as shown in Table 4.

Also a change in film for the positive print is necessary. In work with continuous-tone subjects Fine Grain Positive film is used. The same type of developer is used as with the previous positive film, but the development time will be considerably longer. Table 4 gives further information on film specifications. While a slight variation arose with the different films used, the costs of a negative-positive, unmounted slide were found to be from two and one-half to three cents.

Judging Exposures

Some experience will be necessary for accurately judging the exposure of the slide which has been produced. However, a few comments will show the limitations within which it must fall. First, if the image appeared very slowly and refused to come up to its proper strength, it has been under-exposed and another slide must be made. If the image appeared nearly immediately, it was over-exposed and another slide should be made; cutting the development short will not help as the projected slide would appear weak with muddy shadows and veiled highlights. Continuous-tone transparencies should show detail in both highlights and shadows when viewed with transmitted light. Highlights should not be washed out, but should be slightly grayed over; the deepest blacks should be practically opaque. In line copies as much contrast as possible is desired; the blacks should be as deep as possible while the white areas should

TABLE 4

CONTINUOUS-TONE MATERIALS AND DATA FOR THE NEGATIVE-POSITIVE PROCESS

To make the negative use	Develop in (68)	*Develop for (min.)	Fix in Kodak	Fix for (min.)	Safelight
Panatomic X	D 76	11 - 14	acid fix or F 7	10 - 20 3 - 5	total dark
Plus X	D 76	13 - 17	acid fix	5 - 10	total dark
Ansoo Supreme	D 76	13 - 17	acid fix	5 - 10	total dark
Ansoo Ultra-speed Pan	D 76	17 - 20	acid fix	5 - 10	total dark

To make the positive use	Develop in (68)	*Develop for (min.)	Fix in Kodak	Fix for (min.)	Safelight
Fine Grain Positive	D 72, Versatol, or Dektol	$1\frac{1}{2}$ - 7	acid fix	5 - 10	Wratten OA Wratten 1A

* First figure applies if continuous agitation is employed, second figure if intermittent agitation is carried on.

** Washing in cold, running water for thirty seconds should take place after development and before fixing. After fixing a thirty minute rinse should be given.

appear clear. The use of a reducer, such as R-4a will help if the clear areas are slightly veiled.¹

After fixing, washing, and drying, the transparency is ready for a final critical analysis. For this purpose the check list on page forty-five should be used. All points on the list must be considered in judging the completed slide, with the exception of the points covering masking and binding which will be observed when those steps are completed.

Three Additional Slide Making Methods

Three further methods of slide production were found to be of importance. The use of color film to produce colored transparencies is a relatively simple, but highly effective method. As most users do not process their own films, details of this procedure will not be included here; however, full details will be furnished by the Ansco Corporation upon request. Somewhat more care must be taken when using color film in obtaining correct exposures than with black and white films, and the costs involved are greater, approximately eighteen cents per slide mounted in cardboard. Care must be taken to use only artificial or Type A film indoors and Daylight or Type A with a daylight filter on the camera when taking outside scenes. With these precautions observed this method proved to be highly successful.

1. Kodak Data Book - Slides, op. cit., 18-19

Another technique involved the use of lantern slide plates. The glass plates have been treated so that any good negative may be printed on it by projection or contact methods. An advantage of this method is that the glass can act as one of the cover glasses in binding. Several types are available: medium for continuous-tone negatives, contrast for line copy as well as continuous-tone subjects of low contrast, and the anti-abrasion contrast which is the same as the contrast except that it has a protective covering to protect the emulsion. Only one plate can be printed at a time and these plates are quite expensive, about sixteen cents for a paper mounted slide, thus they are not too practical for general use. Where few slides are to be made and projection printing with an enlarger is possible this technique would be desirable. Further information may be obtained from the Kodak Data Book - Slides.¹

A last technique was suggested by Koos². He found that in common line transparencies an excessive amount of glare was present. The use of Kodalith film produced a white line on a black background, eliminated the glare, and allowed projection in a partially lighted room. There is no negative to positive step; the Kodalith sheet film is cut to the proper size, placed in the focal plane of the camera and the picture taken. Some inconvenience arises in the

1. Ibid., 6, 10, 11, 46, and 47

2. Koos, Earl Lemon, "Real Daylight Lantern Slides," Educational Screen, 29: 426, December, 1950

use of this film as it must be cut to the proper size without exposure to light; it requires much illumination during exposures, a more accurate exposure, and is several times as expensive as the direct positive method.

Masking and Binding Procedures

The next step in slide production, masking and binding, is the final act, and it is an important one. An improperly masked slide will not be pleasantly viewed regardless of the excellence of the planning and photographing. While masks can be made at home, Lockvey¹ advises against it. He feels that the corners and edges of commercial masks are more accurate and that an aluminum slide is necessary to prevent over-heating the slide.

Glass versus Paper Mounts

Many types of bindings are available and there is some disagreement as to which is the best. Various ones will be found listed in the appendix along with a brief account of features and prices. A major decision must be reached as to whether cover glasses are to be used or not. McKown and Roberts² maintained that satisfactory results are obtained with just a cardboard mounting. Leder³ agreed

1. Lockvey, A. J., "Lantern Slides," The Encyclopedia of Photography, New York: Nat'l. Education Alliance, Inc., Vol. 6, 2198-2217

2. McKown, Harry C. and Alvin B. Roberts, op. cit., 130

3. Leder, Jon B., op. cit., 126-27

that glass covers were not needed if reasonable care were given the slides. Kinder¹ concurred, "In fact most two by two slides are now paper mounted, and this is quite satisfactory in spite of the fact that the film is actually unprotected."

A contradictory viewpoint was held by Fern and Robbins² who contended that glass slides must be used if the slide is to see much service. Golterman³ said that glass bindings are more practical.

Haas and Packer⁴ took up a middle position explaining that cardboard slides are satisfactory only if the slide is to remain in the projector for less than three minutes at a single showing, while glass mounts may be viewed three or four times as long if desired.

Actually one cannot say that one argument is correct and the other incorrect; several considerations must be taken into account. The positive materials used in slide construction were found to have a low resistance to heat; they curled or crinkled quite easily when used in certain projectors, principally those without blowers which used two-hundred watt lamps or larger. For satisfactory results under all projection conditions these black and white slides must be mounted between glass covers. Color transparencies were found to resist over-heating much better, but if the projector used had a

1. Kinder, James F., op. cit., 171

2. Fern, George H. and Eldon Robbins, op. cit., 58

3. Golterman, Elizabeth, op. cit., 138

4. Haas, Kenneth B. and Harry Q. Packer, op. cit., 37

tendency to become excessively hot some difficulties did arise. Further, unprotected slides were found to become scratched and finger-printed with use even though care was exercised. Certainly in a classroom situation this would be further emphasized.

Glass coverings on slides are to be advised in most cases. If one is to use exclusively a projector which is known to run without becoming warm and is going to be able to see that a clean, well protected storage place is always available, as well as being assured that careful handling will take place during use, cardboard mounts can be used successfully with a resultant financial saving. In typical qualities, glass slide covers cost approximately seven cents, while paper mounts cost but three cents.

The masking and binding processes are quite simple. If direct positive film has been used, the emulsion side should face away from the light of the projector; therefore, it will be covered by the plain side of the mask. If the negative-positive process has been used, the emulsion, or dull side, is to be toward the light of the projector and will be covered by the aluminum side of the mask.

Identifying Data

Certain data must accompany the slide to facilitate its use.

Hockman¹ suggested that as the picture is held right side up, and

1. Hockman, William S., "How to Number and Label Stereopticon Slides," Educational Screen, 25: 450, October, 1946

viewed as it should appear on the screen the following information should be present: a thumb-spot in the lower left hand corner, its title, and the reference from which it was taken. As the slide is turned up-side down the following information should be legible: its title, file number, and slide number. This information may be placed on the white margin of the mask before binding, or may be written on white gummed labels and these placed on the outside of the cover glass, and then varnished to retain cleanliness. The thumb-spot is most easily observed if white in color, and for greatest convenience it should be slightly raised to present an easily discovered area when projecting.

Steps in Binding

The binding steps are as follows: place the transparency properly in the mask as indicated previously, unroll about ten inches of binding tape and leave it gummed side up on the table, place the cover glasses evenly on either side of the masked film, place the cover glasses on the tape as shown in Figure 4, hold the glasses tightly and roll the slide along the center of the tape until three sides have been covered, cut off the first end of the tape and miter the end as shown, fold down this first side except at the end, place the tape along the fourth side, cut it off and miter the end, miter the remaining three corners as shown, and press the tape down along each side. The thumb-spot and any other necessary information not already included should then be put in place.

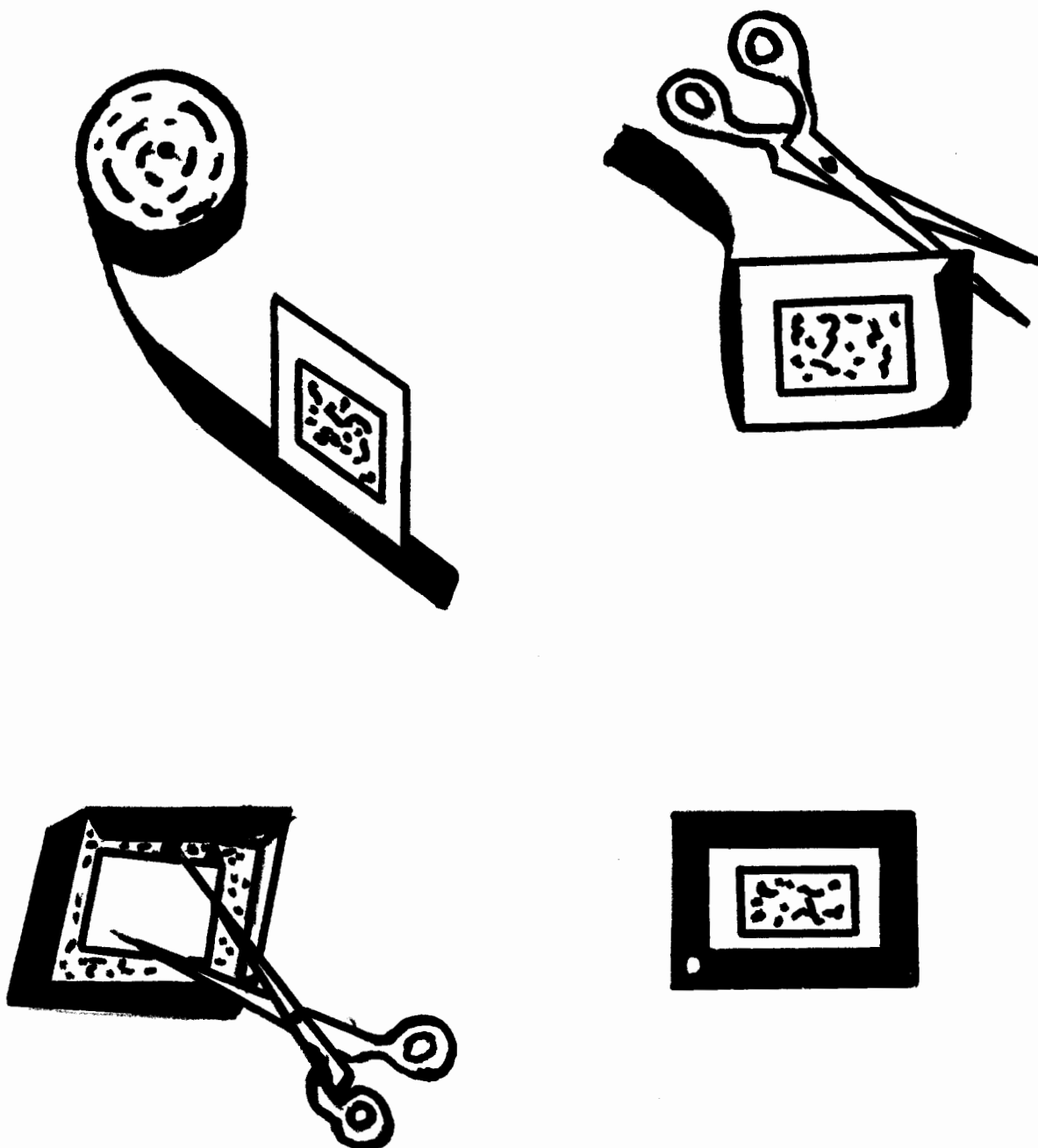


FIGURE 4

STEPS IN MASKING AND BINDING

In preparation for binding the slide should be absolutely dry. In damp weather it is well to place the slide in an airtight container with a desiccating agent, such as activated silica gel, for fifteen to twenty minutes. The application of film lacquer to the transparency before binding is useful to insure a longer, more satisfactory slide life. The dry film should be cleaned with a camel's hair brush before lacquering. It is then placed on a flat surface, emulsion side up. The edges should be taped to the surface with the perforations covered. Lacquer is then applied with a camel's hair brush and the film dried for about ten minutes. It is then bound as usual.

The use of diagonal lines on the tops of the slides within a file is advocated by Becker.¹ This may be accomplished with oil paints, colored tape and similar substances. In this way any slide can immediately be put in place within its box. To separate slides of various boxes and prevent mixing, the use of different widths, colors, or combinations of vertical and diagonal lines is recommended.

Although many other specific techniques were described in the various sources analysed, certain considerations appeared to make omission of them advisable. In most cases of this nature the use of expensive equipment and/or complicated processes were the major deterrents to general utilization. Throughout this report, those procedures which yielded satisfactory slides with the least expenditure of

1. Becker, William J., "Quick-Check Your Slide Sets," Educational Screen, 20: 127, March, 1941

time and money have been emphasized. However, quality of results has not been sacrificed at any stage. The procedures outlined in this chapter will be useful in nearly all situations the slide maker will encounter. But there will be exceptions, in which case a specialized procedure will be necessary. When the reader reaches the point where he finds that he must search for further information concerning these, the goals of this report will have been reached.

CHAPTER VI

SUMMARY AND CONCLUSIONS

A Summarization of the Study

The purpose of this study was to investigate the area of teacher-constructed photographic projection slides: to consider the feasibility of such projects, the qualities desirable in teaching slides, and the techniques of production. In the analysis three sources of information were utilized: A synthesis of pertinent writings was developed, information was obtained through correspondence with manufacturers and distributors of equipment and materials, and first-hand experience was obtained through efforts to put into practice a program of slide production making use of the knowledge gained from the first two sources.

The practicality of the problem centered around considerations of costs involved, time and effort required for the project, and the results which might be expected, both through the value of the slide itself and from simultaneous extra-curricular learnings developed during a slide construction program. It was found that this activity was not considered too difficult, even for elementary school children under competent guidance, by a large majority of writers. These sources also indicated that the costs were nominal, generally being as little or as large as the producer wished to make them.

From a survey of criteria presented by various writers it was possible to arrive at a listing of qualities required in teaching slides. From this listing of qualities a check list was prepared which included those items which experts in this field considered essential. A check list of this type has two important functions; to serve as a guide during production and as a standard against which the completed slide can be measured. Of course, both teaching aspects and mechanical requirements were included.

An important phase of this study was the effort to arrive at a practical working plan for producing teaching slides. It was essential to keep costs of materials and equipment within reasonable bounds, present a plan which would not require highly technical or difficult, laborious tasks and yet, obtain results of a high caliber. Information useful in meeting these goals was assimilated from writings in photographic and educational texts and periodicals, distributors and manufacturers of materials and equipment, and through experimental uses of the various methods presented. As a result not a single plan was developed, but rather, two major ones, each to be used with specific types of subjects evolved. These were presented in Chapter V in relatively general forms, adequate for use by any teacher. Those basic steps necessary for production of slides were emphasized while the more specialized techniques were only briefly mentioned as they will naturally be added later, after the original experiences have been mastered.

Limiting Factors of the Study

Certain difficulties became evident during the course of the study which made it impossible to obtain as complete information in some areas as was desired. This was particularly true of the previous studies in the realm of information related to the psychology of learning and its subsequent application to learning from slides. A quantity of research has been done on the functioning of the learning processes, but these have not been interpreted in regard to qualities which will produce the optimum learnings in slides. Apparently little research has been done specifically to determine how one can best learn from still pictures.

The results of the study were further limited by the lack of equipment and materials available. Obviously, it would be impossible for an individual to accumulate, or have access to, all of those items listed as valuable in slide production. Thus, in some instances the actual utility of an item, or the comparative effectiveness of one piece of equipment as related to another could not be ascertained. It was not a goal of this study to compare qualities of materials and equipment; although, such a project would have been of value if it had been possible. In most cases reliance has been made upon manufacturer's and distributor's data.

Many methods and special techniques of producing slides were discovered during the collection of data for this study. In many cases a source was discovered which attacked a specific problem which

would not be of general pertinence during most slide construction. Even though these techniques were of importance under given conditions they could not be included in this report. One of the primary objectives of the study was to present a pattern for slide production which would not be handicapped by involved or technical methods; unfortunately, this required certain omissions.

Conclusions and Recommendations Resulting from the Study

With the completion of the study certain findings have become apparent. The following conclusions will summarize the results of the study:

1. Teacher production of two by two inch photographic slides to be used for specific classroom instruction situations is feasible. It is not a difficult, lengthy, or costly process.
2. Excellent results may be anticipated within the classroom both as an academic and as a socialization project.
3. Certain requirements must be placed upon the slides produced; a quality guide as on page forty-five will aid in this.
4. Slide production must follow a systematic, thorough planning routine; pages forty-six and forty-seven present such a schedule.
5. A working plan for slide production must be flexible. The great majority of cases may be handled by following through one of the patterns presented in Chapter V.

Implications for Further Study

A service to the field of education, and consequently to the whole nation, is rendered by those who are not satisfied with doing an adequate job, but with an extra effort do a superior job. The project outlined in this study will be of interest to persons of this bent. It is not a panacea, at most, a voice in the wilderness striving to add its blaze marking the trail. To those who find some value in the project, pioneering in a field new to them, will come a swelling feeling of accomplishment. The way is not one of ease, mistakes will be made; a wrong course will be pursued from time to time. But, if after mastering these techniques, one should see fit to move on, many opportunities are present for further explorings. A service will be done by the one who discerns more accurately the relative values of black and white slides and colored slides when teaching various types of lessons. A similar study might involve the learnings obtained from various types of slide scenes such as animated drawings, graphs and charts, natural scenes, and silouhettes. It would be well if a more conclusive relationship between the learnings obtained and children's preferences for slide types could be determined. A study of great usefulness would result if the methods most accurate in analysing teaching qualities of slides could be developed and presented in an objective, easily manipulated form.

APPENDIX

CONTENTS

APPENDIX

To facilitate use of the techniques set forth in Chapter V, the reader should have access to sources of materials and equipment which are helpful in slide production. In most instances these items may be obtained from local photographic suppliers, although in some cases a special order will be necessary. For convenience in this respect, some addresses of manufacturers or distributors will be included in this Appendix.

The information presented below has been obtained directly from the sources who are in a position to know the specific qualities of their supplies. Letters were sent to some of the better known manufacturers and distributors of useful aids to slide production. The data gathered through the replies received has been compiled into a listing of sample materials and sample equipment which will help the slide maker. As simply an introductory listing of some of the available source appears, it is certain that the reader will be able to add to them through his own experiences over a period of time. The essential accomplishment is to present such an introductory list which will enable the reader to start on his slide making campaign well equipped to carry the project to a successful conclusion.

While approximate prices will be included whenever practical, it must be remembered that these prices were in effect at the time

of the writing of this report. However, they are certain to fluctuate somewhat over a period of time and may vary slightly in different locales. In all cases a retail price is the one listed, although the reader may find that school discounts and the like would cause a change to his advantage.

For convenience the presentation of the appendix has been divided into several classifications. These are: Binding and Masking Materials, Cameras, Copy Equipment, Developers and Other Solutions, Films, a copy of the letters sent out, and a listing of addresses of concerns mentioned in this Appendix.

Binding and Masking Materials

Brumberger Co. Inc. produces slide mounts consisting of cover glasses with frames. In use the film is placed between the cover glasses and the two sides snapped together. They are very easy to use, although no provision is included for masking parts of the picture area. 20 mounts/\$1.39

Eastman Kodak Co. offers the Kodak Ready-Mount, a cardboard frame for 35 mm slides. Glass covers are not used, nor is there provision for masking. 50 mounts/\$1.75 Eastman also offers a slide kit which consists of glasses, masks, tape, and gummed thumb spots. 50 mounts/\$3.45

Golde Manufacturing Co. makes an aluminum binder which includes cover glasses. They are re-usable and easily handled. 20 mounts/\$2.15

E. Leitz Inc. manufactures a device which aids in mounting slides, the "Bindomat". It has a channel in which the tape is placed; the slide is put in place and the tape cut with a cutting edge. The slide is then passed through rollers to seal the tape to the cover glasses. A light to be used for inspection purposes is also built into the device. The price with materials for 50 slides/ \$18.00. Cover glasses, tape, and masks sufficient for 50 slides/ \$3.45. Aluminum mounts with cover glasses are also available through this source. 18 mounts/\$1.39

Porter Manufacturing and Supply Co. has a self-sealing mount on the market. It consists of a one-piece cardboard mount. The transparency is put in place, the mount folded over it and pressed firmly in place. An adhesive is present on the inside surface and seals the mount. These may be purchased with or without acetate covers for the film. 50 mounts/\$2.88 and \$1.73 respectively.

Cameras

Bell and Howell Co. presents a miniature camera, the Foton, which is guaranteed against mechanical defects for its lifetime. It features an automatic film transport, shutter cocking, and rapid sequence. It is equipped with an $f/2$ lens and has shutter speeds ranging up to $1/1000$ of a second. A coupled rangefinder and eye level viewer are included. The Camera alone sells for \$485.

Bolsey Corporation of America produces several 35 mm. cameras which fall within the moderate price range. The Bolsey B-2 has an $f/3.2$ lens and shutter speeds from $1/10$ to $1/200$ of a second. The split-image rangefinder focuses from two feet to infinity. The Bolsey B is quite similar, but does not include a double-exposure preventative, flash synchronization, depth of focus scale, or film load indicator as does the B-2. The B-2 sells for \$73.50 and the B for \$61.50; these prices include only the cameras. Bolsey also makes a twin lens reflex camera with ground glass reflex focusing and an eye-level viewfinder with a coupled rangefinder. It also has the additional features which the B-2 has, but the B does not. The lens is an $f/3.2$ with stops to $f/16$. The shutter speeds and range are the same as that of the B-2. This camera sells for \$109.50.

Argus, Inc. manufactures two 35 mm. cameras which are useful in slide work. One is the C-3; it has a coupled split-image rangefinder, built-in flash synchronization, and an automatic frame counter. The lens is an $f/3.5$ with stops to $f/16$. Shutter speeds range from $1/10$ to $1/300$ of a second. The price, including flash attachments and a carrying case is \$69.50. The C-4 is similar in most respects; however, it does have an $f/2.8$ lens with stops to $f/22$ and double exposure prevention device. Camera alone/\$99.50.

Eastman Kodak Co. is the producer of a large number of cameras; these range through a large price field. One of the most economical 35 mm. cameras available is the Kodak Pony 135. It has an $f/4.5$

lens and shutter speeds from 1/25 to 1/200 of a second. A built-in flash synchronization unit is present along with an optical eye-level viewfinder. \$35.75. The Kodak Signet 35 is found within the moderate price range. It uses an f/3.5 lens, has a synchronized flash unit, and shutter speeds of 1/25 to 1/300 of a second. The eye-level viewfinder is coupled to a rangefinder, with ranges from two feet to infinity. An automatic film stop, exposure counter, and double exposure prevention device are also included. \$95.00.

Exakta Camera Company distributes a popular German camera, the Kine Exakta. This camera is available with various lenses, ranging from an f/1.9 to an f/3.5. The focal-plane shutter has speeds varying from 12 seconds to 1/1000 of a second. Extension tubes and microscopic attachments are available along with many supplementary lenses. A reflex type of focusing is employed; this views the scene to be photographed through the picture taking lens, thus eliminating all difficulties associated with parallax. \$199.50 to \$313.75

E. Leitz, Inc. distributes Leica Cameras of great variety. The Leica 1c has a focal-plane shutter with speeds from 1/30 to 1/500 of a second, eye-level viewfinder and helical focusing. The Leica 2c adds a coupled rangefinder and other features, while the Leica 3f presents an easily operated mechanism with even greater opportunities through flash synchronization for all shutter speeds up to 1/1000 of a second and for strobe units. Prices start at \$136 and range depending upon model and lens, to \$472.80.

Copying Aids

Eastman Kodak Co. makes various lens attachments which are useful in copy work. The portra lenses allow focusing as follows: Plus 1, to 21 inches; Plus 2, to $13\frac{1}{2}$ inches; Plus 3, to 10 inches. They sell for \$2.80 each. The Pola-screen is useful in eliminating reflections. It retails from \$7.50 to \$11.00.

Exakta Camera Co. produces a Copymat which is useful to owners of Exakta cameras when doing copy work. It holds the camera and the materials which are to be copied. Two light stands are included with reflectors to light the horizontal easel-like base. Two basic units are present, the base and the vertical support for the camera and lights. \$110.50. Also available are a microscope attachment for connecting the camera to a microscope, and a series of extension tubes for use in macro-photography, in which the size of the subject is not magnified, but where complete slides show extreme close-ups.

E. Leitz, Inc. offers a device which enables owners of Leica cameras to do copy work through a type of ground glass focusing. The Focaslide consists of a slider and a base. The lens is placed on the base where it is used for focusing. When the composition appears just as desired, the camera, which has been attached to the slider, is moved into position and the picture taken. \$45.88, Focaslide unit only.

Although information was not obtained in the direct manner utilized for those items listed above, it is most desirable to

include mention of an instrument known as the Speed-O-Copy. Smith¹ describes it as a unit which will allow ground glass focusing with Kodak Ektra, Leica, Contax, Kardon, Clarus, Argus 21, C-2, C-3, and Perfex cameras. It is said to be very simple to operate, accurate, and economical. The method appears to be very similar to that employed with the Leica Focastide. It is available through D. Paul Shull Co. at \$70.00.

Developers and Other Solutions

Eastman Kodak Co. was the only source which returned satisfactory information as to the specific type of developers to be used with various films. Their recommendations were as follows: Direct Positive developer for all Direct Positive films. \$2.90 for sufficient developer for eight thirty-six exposure rolls. D-11 for line-copy negatives, D-76 for continuous-tone negatives, and D-72, Versatol or Dektol for both line and continuous-tone positives were their further suggestions. Kodak Acid Fixer, Kodak Fixing Bath F-5, and Kodak Rapid Fixer F-7 were recommended for fixing solutions; the latter is used with continuous-tone and line-copy negatives when Panatomic X or Contrast Process films have been used. Kodak Farmer's Reducer is used to reduce overexposures and for clearing fog from line-copy negatives and positives. Kodak Chromium Intensifier is used for intensifying weak negatives of both types.

1. Smith, Nelson, "The Production of Color Slides for Classroom Use," Teacher Education, 15: 26-27, June, 1952

It is most difficult to state prices for the solutions mentioned above as one may wish to buy in different quantities or to produce a varied number of slides from time to time. However, under normal conditions the total cost for all solutions will average considerably less than one cent per slide.

Films

The Direct Positive film used in making continuous-tone slides may be purchased on special order from the Eastman Kodak Company. It retails for \$7.90 per hundred feet. Other continuous-tone materials for the negative-positive process include Kodak Panatomic X @ \$.95 per twenty exposure roll, Kodak Plus X @ \$.95 per twenty exposure roll and \$2.32 for twenty-seven and one-half feet, Ansco Supreme and Ansco Ultra-Speed Pan @ \$7.43 per hundred feet and \$.95 for a twenty exposure roll. Those negative films mentioned above may also be purchased in rolls of thirty-six exposures and in fifty feet rolls. For making positives one hundred feet of Fine Grain Positive may be purchased for \$2.69.

Line-copy materials for making negatives include Micro-File @ \$4.50 per hundred feet, and Plus X as mentioned above. Kodak High Contrast Positive sells at \$2.05 for fifty feet; although designed for producing positives, negatives can be made from this film if high contrast is necessary.

For making color slides under artificial lighting conditions one may use either Kodak Kodachrome - Type A, or Ansco - Tungsten Type. For natural lighting conditions one may use Kodachrome Daylight Type or Type A with a daylight filter, or Ansco Daylight Type. Kodak prices are \$3.55 for twenty exposures and \$5.50 for thirty-six; this price includes processing. Ansco prices are \$2.21 for twenty exposures; this price does not include processing which is \$1.00 additional.

Addresses

Ansco, A Division of General Aniline and Film, 175 Clinton Street, Binghamton, New York

Argus, Inc., Fourth and Williams Streets, Ann Arbor, Michigan

Bell and Howell Co., 7100 McCormick Road, Chicago 45, Illinois

Bolsey Corporation of America, 118 E. 25th Street, New York, New York

Brumberger Co., Inc., 34 34th Street, Brooklyn 32, New York

Eastman Kodak Co., 343 State Street, Rochester 4, New York

Exakta Camera Co., Inc., 46 West 29th Street, New York 1, New York

Golde Manufacturing Co., 1240 West Madison Street, Chicago 7, Illinois

E. Leitz, Inc., 304 Hudson Street, New York 13, New York

Porter Manufacturing Co., 2836 Sunset Boulevard, Los Angeles 26, California

D. Paul Shull Co., 240 South Union Avenue, Los Angeles 26, California

For further listings of photographic equipment and materials the reader is directed to a thorough presentation of this nature in the "1952 Directory of Photographic Equipment"¹ in the May, 1952, issue of Photography magazine.

1. "1952 Directory of Photographic Equipment," Photography, 30: 95-218, May, 1952

Sample of the Letter Form

721 N. Meridian Street
Puyallup, Washington
March 1, 1952

Sales Department
Eastman Kodak Co.
343 State Street
Rochester 4, New York

Dear Sir:

I am in the process of writing a Master's thesis on the topic, A Study of Teacher Production of Two by Two Inch Photographic Projection Slides for Classroom Instruction. It is hoped that a potentially useful source of supplementary slides may be utilized through photographing natural scenes, as well as employing photographic copying techniques. The usual operations of photographing and developing negatives, printing and developing positives, and masking and binding are to be included.

To be of practical value, not only must the procedures be set forth, but sources of equipment and materials should be identified. I am hoping that you will be kind enough to supply me with descriptive data of those items which you manufacture or distribute which would be helpful in carrying out a slide production project such as I have indicated.

Sincerely,

Samuel W. Peach

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