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An Audiovisual Program: The Selection, Utilization and Evaluation of Audiovisual Materials for the Morgan Junior High School Seventh Grade Physical Science Program

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AN AUDIOVISUAL PROGRAM: THE SELECTION, UTILIZATION AND EVALUATION OF AUDIOVISUAL MATERIALS FOR THE MORGAN JUNIOR HIGH SCHOOL SEVENTH GRADE PHYSICAL SCIENCE PROGRAM

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CHAPTER I

INTRODUCTION

An outstanding development in modern education is the growth in the use of audiovisual materials for education. In education we should appeal to the mind chiefly through the visual and auditory sense organs, since it is possible that 85 per cent of our learning begins at those terminal points (1:xi).

A revolution in communications is under way. This revolution is generated by the rapid developments in the fields of mass communication media and instructional media such as radio, television, teaching machines and other devices that assist in teaching and learning. The introduction of these innovations into the field of education has made necessary a wholly new evaluation of teaching methods and classroom techniques and procedures. The new tools and teaching materials are playing a significant role in education, and teachers need to understand their potential and to learn how they can be used to maximum advantage in improving classroom instruction.

In a very practical sense audiovisual materials can, and do, free teachers of a great deal of routine and detailed work and instruction. In fact, new theories of

communication include a role for more technology and automation for the very purpose of freeing a part of the teacher's time for more creative work (2:v). Teachers are beginning to recognize the value of these materials as very helpful tools.

Audiovisual techniques serve a more valuable function in the teaching of science than in any other field of education. Actually, most of the basic tools of science instruction are audiovisual materials (44:74).

At the beginning, we have realia--all the actual "things" of science which we handle--which appeal to the senses, creating interest when we look at or feel or smell or listen to them. Realia may be a kindergarten collection of leaves or a collection of insects in a Biology room. Included too, are the tools and materials of the study of science as we move upward in the pursuit of scientific learning. And, almost immediately, we reach areas where we can get help from audiovisual materials that are not real, but are made nearly real by the means of electronics, sound or projection equipment.

I. THE PROBLEM

Statement of the Problem

Through this study the writer will attempt to: (1) identify and investigate the current standards of an

effective audiovisual program; (2) identify and evaluate the rationale which can be used in determining the basis for the utilization of audiovisual materials in the field of science education; (3) use this rationale as a basis for selecting appropriate audiovisual materials for the seventh grade physical science curriculum in Morgan Junior High School; and (4) develop recommendations concerning the utilization of audiovisual materials in the science curriculum at Morgan Junior High School in Ellensburg, Washington.

Importance of the Study

There are four factors which justify this study. They are as follows: (1) audiovisual devices and materials need to be extended, improved and updated; (2) scientific information is growing at the incredible speed of approximately 300,000 words every five minutes (19:1); (3) with the expanding techniques, new materials and equipment, there is a need to identify an adequate rationale for every course of study; and (4) every young citizen should be provided with a maximum of basic scientific concepts, generalizations and understandings of our scientific world.

Because of the scientific knowledge explosion, science educators will have to develop a highly effective and efficient method of educating our youth. To achieve

this, the greatest possibility is in the realm of audio-visual materials.

Limitations of the Study

This study shall be limited to the audiovisual materials available in the libraries of the following educational institutions: Central Washington State College, University of Washington, and Washington State University. In addition to these library materials, the writer will use materials available at Morgan Junior High School and materials from Inland Audiovisual Company, Moody Institute of Science, and the Encyclopedia Britannica Films Company.

This study shall be further limited to physical science at the seventh grade level at Morgan Junior High School in Ellensburg, Washington.

Plan of Study

The plan of study is as follows: Selected literature and research pertinent to the development and the establishment of an audiovisual center and the use of audiovisual materials in the field of science education will be reviewed in Chapter II.

From the inferences established will come the appropriate rationale that will be applicable to the seventh grade physical science program at Morgan Junior

High School. The rationale and procedures used will be discussed in Chapter III of the study.

A seventh grade unit on light will be presented in Chapter IV. The writer will attempt to illustrate how the recent methods of audiovisual instruction can be integrated into a modern science program at the junior high school level.

Chapter V contains a summary of the study. Recommendations are listed as they apply to audiovisual materials in Morgan Junior High School.

II. DEFINITION OF TERMS

Combination Format

Combination format denotes one of the four formats used to evaluate audiovisual materials. It is a combination of the profile, checklist and narrative format.

Instructional Materials

Any device or material by which the learning process may be encouraged or carried on is termed Instructional Materials.

Non-Projected Materials

Non-projected materials are materials that require no projection equipment in order to be utilized. The non-projected materials included in this study are models,

charts, tapes, records, graphs, and pictorial material.

Projected Materials

Projected materials are materials that require projection equipment in order to be utilized. The projected material used in this study are 16 mm films, filmstrips, overhead transparencies, pictorial material for use of the opaque projector, and 8 mm single concept films.

Student Laboratory Session

The student laboratory session is a method of employing the problem solving technique in which the student works with a partner or individually to acquire knowledge through personal investigation.

Topical Guide

The topical guide refers to the prescribed course outline that the teacher follows in teaching any or all of the various grades in science.

CHAPTER II

REVIEW OF LITERATURE

I. PHILOSOPHY AND PURPOSE

Philosophy of an Audiovisual Program

The task before the schools today is so broad and so complicated in character that education must utilize every tested and approved method known. Only in this way can the schools hope to equip each child with habits, skills, concepts, attitudes, and critical thought processes. This does not mean merely a teaching "for life;" it means "living" during the process (22:9). In other words, the school is not only providing for a productive later life, but is giving satisfaction in learning and living today as well.

A common criticism of educational organizations of the past is that the school existed in a vacuum apart from the activities of the society. Students were taught by monotonous drill to accept the spoken or written word without question. Such a philosophy of education resulted too often in narrowness of outlook, in an inability to think constructively and broadly, in prejudice, in superstition, or in similar behavior patterns (22:9).

A different philosophy of education has now emerged. The purpose of teaching is basically to arouse the pupil and to direct his behavior into channels which are desirable such as the development of proper skills, useful habits, conceptual understandings, acceptable attitudes, personal appreciations, and critical-mindedness. The philosophy of audiovisual education follows this principle and audiovisual materials validate this principle. Audiovisual materials are means to an end, that end being the transmission, creation, interpretation, and evaluation of an experience.

True education is found in direct experiencing. Edgar Dale discusses this further:

> The first and age-old reason for the wide use of concrete experiences relates to the problem of language and meaning. All communication is a sharing of an experience--making it common to two or more persons. This sharing, for example, will range from the meanings secured by a little girl playing with a doll who imitates and thus shares certain family experience, to a graduate course in child development which depends upon language abstractions at a high level of symbolism.
>
> The ability to share important meaning is not confined to persons able to read. The illiterate six-year old before coming to school has learned one or more meanings for at least 2,500 different words. He knows what they mean because he has used them as a means of doing hundreds of different things--eating, playing, making, handling, hearing and so on. He learns that glass breaks, that dogs bark, pencils write, stoves cook.
>
> But when he starts to school, he is sometimes immediately faced with a new problem, learning about

> the world indirectly through the symbolism of written language. His dog at home that barks and runs has now become a pallid symbol--a series of little marks on a piece of paper. In arithmetic he is asked to find the difference between 8 and 10, and it doesn't seem to make any difference to his life. And as William James once put it, "If it makes no difference, what difference does it make?"
>
> And when symbols are memorized in school (because they are not understood), the trouble really starts. As teachers, we quickly learn that students may react with verbal accuracy to questions about history or geography or mathematics, but that they sometimes don't know what they are talking about (11:1-4).

The philosophy of the audiovisual program should follow closely the philosophy and goals of the school. There must be concrete guidelines to follow if an audio-visual program is to be established. First and foremost is the philosophy and purpose of a program.

Olyn M. O'Connor of the Schenectady, New York, Public Schools listed ten items which would help to establish a philosophy and purpose for an audiovisual department. His article states:

> We believe that A V instruction:
>
> 1. offers a choice of media to compel the attention and stimulate the learning process of students with varying aptitudes, interests, abilities and creativity;
> 2. overcomes limitations of time, space and size, develops an awareness by "you are there" method;
> 3. provides all group members with a common experience;
> 4. shows life processes via camera techniques that could not otherwise be observed;
> 5. influences attitudes and deepens understandings by widening of perspectives;
> 6. provides classroom teachers with the assistance of

an expert and/or special materials in subject areas where she feels inadequate;
7. reduces time and effort; more can be learned in less time than by the more traditional methods alone;
8. steps up skill learning;
9. speeds language learning--language laboratories, tapes, records, etc.
10. builds reading speed and comprehension (34:488).

Values of the Program

There are many values derived from an audiovisual program. Audiovisual materials alone, however, cannot produce the values of a program. To be effective, they must be used by creative teachers in a classroom environment conducive to learning and teaching. Robert E. De Kieffer, Director of the Bureau of Audiovisual Instruction at the University of Colorado lists a series of values derived from the use of audiovisual materials in teaching:

1. They stimulate a high degree of interest in students--and interest is an important factor in learning.
2. They provide a concrete basis for the development of understandings and thought patterns, thereby reducing the number of purely verbalistic responses made by students.
3. They supply the basis for developmental learning and thereby make learning more permanent.
4. They provide experiences not easily secured in other ways and hence contribute to the depth and variety of learning.
5. They contribute to the growth of understanding, thereby contributing to vocabulary development.
6. They offer a reality of experiences which stimulate the individual activity on the part of the learner.
7. They motivate students to investigate, thereby increasing voluntary reading (12:3).

Functions of the Program

The four R's of an audiovisual education program are the function of the program. An effective program makes sure that the right materials and equipment get to the right place at the right time, and see that they are used in the right way (39:187).

Robert E. De Kieffer says there are five primary functions and four secondary functions in any educational program. The primary functions are: (1) informing, (2) educating and training, (3) supplying, (4) producing, and (5) assisting. The secondary functions are: (1) reporting, (2) recommending, (3) cooperating and (4) evaluating (12:100).

II. THE CENTER

The basic idea of the instructional materials center is that in every school there should be one place where a student doing research or an instructor planning a series of lessons might find all necessary materials available in the institution on the particular subject at hand. Here will be centered not only the books, magazines, newspapers, pictures, and the many other printed materials usually found in a library, but also such things as films, film strips, recordings, tapes, maps, charts, globes, models, graphs, museum items, and other things that could have a wide general interest for the whole school. These

materials will be catalogued and easily accessible for those who wish to use them.

In the Dade County (Miami, Florida) School System, the Instructional Materials Department includes audio-visual services, school library services, textbook services, the professional library and the distribution services. The philosophy is that the classroom teacher needs to be able to get all the instructional materials she needs at one location in the building. This should be as nearly central as possible (24:471).

The Audiovisual Department of the Seattle Public Schools advocates centralization also. The department states that the audiovisual service program should be so organized that a variety of materials are made available to teachers when they are needed for maximum contribution to teaching objectives. Going along with this are two other important principles, as follows: (1) Convenience in availability of materials and equipment increases teacher demands for materials and facilitates effective use and (2) The audiovisual service program should be locally centralized for unity of purpose, planning, promotion of use, and economy (13:194).

Decatur-Lakeview School and West Leyden High School in Illinois have found that centralization is much more

effective and not nearly as expensive (29:690).

There are several advantages of having one organization, an Instructional Materials Center, provide communication media. John G. Church, Associate in Educational Communications at the University of New York discusses the advantages of centralization:

1. The students and teachers and other users of the center would need go to only one location.
2. With the centralized cataloging possible, the user could very easily find various communications media which apply to particular topics.
3. Technical processes including ordering, receiving, and cataloging materials would not be duplicated.
4. Since many of the materials of concern both to the librarian and to the audiovisual specialist are the same (for instance, recordings), there would be less unnecessary duplication of purchases.
5. Staff time would be used more wisely because, rather than having two persons work part-time with audiovisual and library materials, a school could have one person working full-time.
6. Budgets would be more likely to have an item for instructional materials, whereas at present many school districts have either inadequate budgets or no budgetary allocations for audiovisual and library materials.
7. Personnel working with materials would be more likely to have a higher degree of professional training as a materials specialist, since this would be a full-time, major concern.
8. As new developments appear one comes to the realization that the one permanent factor is change. One center, then, would be able to add whatever new communications media were made available without the center itself becoming out of date because it has stayed in a particular category such as a library or audiovisual center (9:32).

Services Offered by the Center

The purpose of the center is to improve instruction through service to teachers and pupils. Service is what the classroom teacher wants and respects. The classroom teacher wants to know what is available, where it is available, how much it costs, how it can be used, and what results can be obtained from it. Teachers can be made aware of what is available in equipment and materials. They need to be encouraged to use these materials. Teachers need to be given ideas on how to use the various materials. This can be accomplished through workshops or in-service courses. These are the services that such a centralized instructional materials center can perform.

William C. Miller states two major types of activity that go on in the center:

(a) reading, listening to, and viewing of materials by teachers and students individually and in small groups;
(b) teacher and pupil preparation of teaching aids such as graphs, charts, and slides (30:365).

Jerrold E. Kemp feels that when the instructor leaves his laboratory he returns to the ancient technique of communication--the lecture. The audiovisual center can change this by producing appropriate material to meet the needs of the instruction (21:280-281).

Besides acquiring, organizing, housing and distributing a whole range of learning resources, servicing and repair of materials and equipment are also the responsibility of the instructional center.

Physical Layout of the Center

The schools of today must be planned and constructed to accomodate a wide variety of laboratory experiences and a great deal of individual study. They must also be designed to make full use of the numerous audiovisual materials and equipment now available (12:67).

Lloyd Trump, in writing about the schools of the future, stated:

> Educational facilities will no longer be merely a school building and its grounds. Space within the building will be planned for what will be taught in it and how it will be taught. Installations for effective use of electronics and mechanical aids will be provided. . . Educational facilities of the future will be functional, flexible, pleasant and utilitarian. Buildings will have improved acoustics, better light and ventilation control and readily movable partitions. Architects, engineers, scientists and educators will work together to design better equipment and supplies and better structures to house them (47:28-30).

Some of the following facilities are suggested by Charles Wright and Kenneth Berry (52:222-225), A. B. Roberts (40:532-533), and Walter A. Wittich (50:80;82;84), and should be considered for inclusion in a new audiovisual center:

1. Offices to house the administrative staff
2. Storage space for equipment and materials
3. Distribution area and practice laboratories
4. Preview and auditing facilities
5. Educational FM radio station
6. Graphics production facilities
7. Closed circuit television installation
8. Photographic areas
9. Display rooms
10. A multi-purpose room

Ian C. Ironside suggests an "individual project" workroom for use by students or staff. As a part of the center, but separated from it when desired, it would contain a sink and counter space for project development, a photographic reproduction machine, a place to make overlays and sketches, an area for editing, duplicating or developing tapes (20:20).

III. ADMINISTRATION OF A PROGRAM

An audiovisual program presents numerous administrative problems, and the more efficiently these problems are solved, the more effective the program will be. Many of these problems, because of their scope and overall nature, fall on the shoulders of the school administrator.

But, the teachers are the ones who actually utilize the materials, and the ones on whom ultimately the effectiveness of the program depends (22:538).

Audiovisual departments throughout the country vary considerably, but those programs which are considered to be successful have many points in common. Robert E. De Kieffer lists these common factors:

1. They have the financial and moral support of the school administration and the board.
2. They are guided by a carefully conceived and prescribed set of objectives or functions which are designed to implement the philosophy of the school.
3. They are directed by competent, well-trained, professional people whose primary interest is in helping teachers with their problems of communication.
4. They have an instructional materials center to which teachers and other patrons can go for materials, equipment and services.
5. They have an efficient administrative organization which provides precision service to each building within the system.
6. They have adequate budgets with which to carry out the program.
7. They have the enthusiastic support of the teachers whom the program is designed to assist (12:99).

The Director

James S. Kinder lists the qualifications of a director as being: (1) three to five years of successful teaching experience; (2) specific training in the field of audiovisual materials; (3) interest and enthusiasm for audiovisual techniques; (4) familiarity with the content

of the film--films, filmstrips, maps and globes, records, transcriptions, etc.; (5) organizational and administrative ability; and (6) knowledge of curriculum construction and textbook developments (22:541).

In the Toledo School System, the director of the Visual Aids Department is on the Curriculum Staff and directly responsible to the Assistant Superintendent in charge of the Curriculum Department. The director attends the many curriculum meetings as a curriculum member and specialist in teaching-tools matters (18:89).

The duties of the audiovisual director are numerous. The following gives the responsibilities of the director:

1. To assist teachers in defining problems of instruction and in discovering ways of meeting them through audiovisual materials.
2. To act as general information center so that the teachers will know whom to ask about problems concerning utilization, availability of materials, operation of equipment, etc. This function is often best served by a comprehensive program of in-service training which includes faculty meetings, work study groups of teachers, and formally organized credit courses in audiovisual methods.
3. To acquaint his teaching staff with the newest developments in the field, such as new materials, new equipment, research findings, etc.
4. To foster interschool visits by teachers.
5. To advise the administration concerning needed audiovisual materials and equipment (and their estimated costs) (51:528).

Only as the audiovisual director is successful in working closely with teachers, fellow supervisors, and administrators will he fulfill the specific duties and

functions which the administrator has seen fit to assign to him. No director should ever lose sight of the fact that his job is never done, that new problems, new challenges are always ahead. His is the task of continually searching for means of improving instruction and for the more orderly revision and organization of curriculum responsibilities.

The Personnel

The duties mentioned above concerning an audio-visual center are too comprehensive for one person to care for them all. Clerks and secretaries are needed for classifying and cataloging materials, and for keeping records of requisitions and incoming and outgoing materials. Technicians are needed to repair and maintain films and machines. An expert projectionist may be needed to instruct teachers and student operators, and to assist community groups with their programs (22:543).

Large schools usually employ school trucks for distribution and exchange of materials. The drivers of these trucks are part of the personnel and should have some understanding of the nature of the materials they handle (22:543).

Any school that proposes to produce photographs, slides, filmstrips, or motion pictures will need specially trained technicians for this work.

The professional staff should be responsible for the following activities:

1. The evaluation and final selection of audio-visual materials and equipment.
2. The planning and production of special audio-visual materials and the supervision and direction of special radio and television programs.
3. The supervision of the utilization of audiovisual materials within the school.
4. The development and conducting of in-service education programs in the utilization of materials and the operation of equipment for all school personnel.
5. The development and execution of budgets for the program.
6. The consultation with teachers, administrators, patrons, and architects concerning the activities and problems of audiovisual education.
7. The interpretation of the audiovisual program with all of the ramifications to the school personnel and the public.
8. The experimentation with the more effective methods of utilization of audiovisual materials, equipment, and techniques.
9. The evaluation of the entire audiovisual program through study and research (12:103-104).

The Budget

The operation of an audiovisual program is a relatively expensive venture, but the values received are well worth the expenditure.

In public schools, the amount spent as listed by John Moldstad is one per cent of the school's instructional budget exclusive of salaries. As an example, if the student cost is $250.00 the audiovisual program's share would be $2.50 (31:80,82).

Ted Cobun suggests about $20.00 per pupil or five

per cent of the instructional budget, whichever is more. This amount generally will provide a flexible range of instructional materials and equipment and it should support an extensive library facility as well. It should be remembered, however, that this is a reliable guideline for a minimum, not a flat rule. A school district ought to spend as much as it can afford (10:68).

IV. EQUIPMENT

In general, the one who is responsible for selection and purchase of instructional aids and devices will base his criteria and methods of evaluation upon rather earthy considerations. In the first place, he will be faced with a wide variety of widgets, gimmicks, and gadgets from which to choose. His problem is further complicated by the natural bias of the developers and salesmen of commercially controlled aids in favor of their own products. But the confusion of conflicting claims of merit can be dissipated with a little study, consultation, and experiment (17:296).

Walter A. Wittich, in 1958, gave the recommendations of the Audiovisual Commission on Public Information which are as follows:

1. 16 mm projector, one per 300 students or major fraction, at least one per building.
2. Filmstrip and 2" x 2" projector, one per 200 students or major fraction, at least one per building.
3. Opaque projector, one per building.
4. Record players, one per kindergarten class, one to five classrooms for other classes, at least two per building.
5. Tape recorders, one per three hundred students, one per building.
6. Overhead projectors, one for each two classrooms, one out of every two capable of projecting $3\frac{1}{4}$" x 4" slides (50:80,82,84).

John Moldstad has made two additions to this list. They are: (1) radio, one for every five classrooms with at least two per building; and (2) screens, one for every two classrooms (31:80).

The Department of Audiovisual Instruction Subcommittee on Professional Audiovisual Standards recommended guidelines for the Audiovisual Departments in 1965. Dr. Gene Faris, chairman of the committee, lists guidelines rated as weak, good, and superior. The standards for a superior audiovisual program in secondary schools are listed below (14:203-204):

1.	8 mm projector	1 per 15 teaching stations
2.	Filmstrip projector combination slide and filmstrip	1 per 3 teaching stations plus individual viewers in each classroom
3.	16 mm projector	1 per 4 teaching stations
4.	2 x 2 slide projector (automatic)	1 per 10 teaching stations

5.	Projection stands	secure as needed. Every movable piece of equipment should be on a stand.
6.	$3\frac{1}{4}$ x 4	1 per 20 teaching stations
7.	Overhead (10 x 10)	1 per classroom
8.	Opaque	1 per 8 teaching stations
9.	Tape recorder, dual speed--7" reel	1 per 5 teaching stations
10.	Record player	1 per 8 teaching stations
11.	AM/FM Radio	1 per 10 teaching stations plus central distribution
12.	Television receivers	1 per classroom where programs are available. No more than 24 viewers per set.
13.	Projection screens	1 permanently mounted screen per classroom plus portable screens for individual or small group use. No smaller than 70 x 70 with Keystone eliminators. Screen for auditorium.
14.	Closed circuit television	All new construction should include provisions for installation at each teaching station, and older buildings should be wired for closed circuit television as needs develop.

V. CLASSROOMS

Every one of the more than eighty classrooms in Rochester's new East High School has been planned and constructed so that teachers can readily use any kind of audiovisual material and equipment in their teaching.

Paul C. Reed lists the following features which will make each classroom an AV room:

1. Audiovisual blinds are being furnished for all rooms so that outside light may be controlled and rooms darkened to meet all projection standards.
2. A tri-purpose white metal chalkboard is in the middle of the front wall. It may be used as a chalkboard, magnetic bulletin board or a projection surface.
3. There are electric outlets on four sides of each room.
4. A conduit runs from the rear to the front of each room carrying the wires for projector speakers in the front.
5. Facilities for the reception of closed and open circuit television programs have been provided; outlets at the front of each classroom connect via conduit with the radio television studio and the Forum Room. Here, at this center, open circuit programs can be received and redistributed to all classrooms; or closed circuit programs originating here or at twelve remote locations in the building may be redistributed to all classrooms.
6. The usual public address system facilities provide speakers in all classrooms connected with a complete sound distribution system.
7. Added space has been provided as a conference alcove at the rear of each classroom with bookshelves, cabinets, and display space (38:126-127).

John Moldstad discusses other factors that should be considered and included in a classroom:

1. The light control facilities should be capable of varying the room illumination from a daylight level down to a level where the light on the screen surface does not exceed 1/10 footcandle.
2. Each classroom should have a 70" x 70" pull-down screen with provisions for keystoning.
3. There should be electrical outlets in the front and the back of the room and a light switch within easy control of the projectionist.

4. The ventilation system should provide independent controls in each room. The system should be capable of changing from a heating situation to one delivering up to a minimum of 15 cubic feet of air per pupil per minute at any time.
5. Each classroom should be provided with an acoustically treated ceiling. There should also be acoustical separation of adjacent classrooms.
6. The most satisfactory arrangement for loud speakers for AV equipment seems to be the simple use of the speaker attached to the device.
7. Concerning radio and tv provisions, central sound systems are now included as basic equipment in most new schools. Conduits, 1¼" should be used for such installations, since ample room is then provided for the inclusion of the antenna, ground wire, and booster circuit required for adequate classroom reception of radio and television.
8. Each classroom needs facilities for the storage of audiovisual materials. Ideally, facilities should also be provided for safe, temporary storage of audiovisual equipment.
9. Miscellaneous items such as chalkboards, tackboard, bulletin boards and display space should also be provided in each room (31:82).

VI. MATERIALS

Kinds of Materials

Up-to-date instructional aids include a vast range of films and filmstrips, pictures and posters, magnetic and pegboard materials, models and specimens, maps and transparencies, programmed instruction programs, 8 mm single concept films, slides, radios, records, tapes, and television productions.

In the purchasing of 16 mm films and filmstrips, there are three methods of acquisition: (1)direct rental, (2) the rent-to-own plan and (3) outright purchase.

Wittich stated:

> Fortunately, today almost every school system has access to rental films. Most state film libraries make films available for a week's use for a rental fee of from 3 to 5 per cent of the purchase price of the film. An educational sound film in science or social studies (which costs the educational film producer between $15,000 and $20,000 to produce and currently is sold at $55 per 10 minute black and white reel or $110 per color reel) usually is available for rental at $1.75 to $2.50 and $3.50 to $5.
>
> In order to achieve best access to film use, school systems increasingly are purchasing collections of films to be used exclusively in their district. It is estimated that a basic library of from 700 to 1,000 film titles will implement efficiently a curriculum program covering kindergarten through senior high school.
>
> To make it possible to acquire such collections, the major film producers have set up rent-to-own purchase plans. For example, Producer A sells a $60 reel of black and white film for four annual payments of $15.90. Producer B seels a $125 two-reel educational sound motion-picture title for three annual payments of $44.25. Producer C sells a one-reel $55 title for five annual payments of $12.10 (50:80).

The price of 8 mm film varies but experts tend to agree that a ten-minute reel of film with optical sound tracks would be $20.00 for color and perhaps $15.00 for black and white (45:232).

In the Hamburg, New York Central Schools, a locally produced 8 mm film costs less than $20.00. A film such as this includes sound and color and is ten minutes in length (7:234).

Free and inexpensive materials are available to schools. They comprise an important segment of instructional

resources. Various public and private agencies willingly assist schools in obtaining specialized types of materials and services. Many of these are available without charge since government agencies, professional and trade associations, and even some commercial sources are interested primarily in reaching schools and other educational and cultural groups with the messages contained in their materials rather than in making a profit from their sale (6:70).

The sources of these materials are the federal, local, and state governments; professional associations; trade associations and private industry; and foreign governments and travel information offices.

Numerous catalogs and guides list these sources and give specific addresses. The teacher need only decide in which materials he is interested and correspond with the agency or company in order to receive final results.

Cataloging Materials

The production of an audiovisual catalog might be considered by some as their number one AV headache (45:131).

Two forms of catalogs are the book-type catalog and the film title directory. The book-type catalog has a subject listing and an alphabetical listing by title of all the films. A variation of this is the film title

directory which lists only the title of a film. The main advantage of book catalogs is that numerous copies can be printed. The disadvantage of this is that it becomes outdated so quickly. There is the departmental approach in which each title pertaining to that department is listed.

Scheduling Materials

Ole Oines has developed a method for scheduling materials in the audiovisual center:

> For each film, a card was made containing the following information: title of film, catalog number, distributor, cost, running time, date available, teacher, course, room, etc. At the bottom of the card is placed a reorder form which is completed by most teachers immediately after using the film (35:19-21).

This card may then be used for checking, billing and reporting. The cards are mounted for the week on a tack board assigning the projectors for that period of time. At the end of the week the cards are given to the teachers for reordering. They are returned to the audiovisual director where they are filed for future reference.

Production of the Materials

Audiovisual materials are numerous and available to the teacher. Many instructors make little use of them because they often are not related specifically enough to the curriculum units they teach (32:48).

The best answer is to provide facilities for producing audiovisual aids on the spot to supplement those available commercially.

Locally-produced materials have many advantages: (1) they are up-to-date; (2) they allow the instructor flexibility; and (3) the instructor is motivated to try out new teaching methods (28:48).

John Moldstad suggests a local production center that is supplied with all the equipment needed to produce instructional materials with the exception of motion pictures:

I. Workroom
   - A. air brush
   - B. copy camera
   - C. diazo duplicator
   - D. lettering equipment
   - E. dry-mounting press
   - F. storage
   - G. light table
   - H. cutting board
   - I. sink
   - J. spirit duplicator
   - K. stencil duplicator
   - L. 35 mm copy stand
   - M. work table

II. Darkroom

A. enlarger

B. trays, sink

C. dryer

D. washer

III. Office and Storage

A. Motion picture editor (32:49)

Local production activities will be increasing. Jerrold E. Kemp says there are realities we must face to insure the advancement of local production.

First, local production programs will only grow as administrators recognize their value and contributions to educational programs.

Second, financial support must follow administrative support.

Third, media personnel themselves must have better training and more experience with production skills.

Fourth, teachers must be made aware of the many potentials for improved instruction with locally prepared materials to a great degree (21:27).

VII. THE PLACE OF THE AUDIOVISUAL PROGRAM IN SCIENCE

The teacher of science is confronted with the task

of helping pupils understand the processes of biology or all natural phenomena. Audiovisual techniques and materials serve a valuable function in the teaching of science. "Most of the basic tools of science instruction are A V materials" (44:74).

In less than a decade science teaching has found far more innovations and more changes than has been experienced in any like period in its history. The introduction of new approaches to the teaching of the traditional science disciplines in the secondary school has reoriented the topical matter of these courses and of the courses leading up to the high school. These changes have been accompanied by the development of new materials for the junior high level.

> In the game of intellectual musical chairs a junior high school teacher finds himself sitting on any one of a number of new courses or subject matters at the time that any one of the intellectual bands happens to stop playing. It is generally recognized that junior high school science has been, for a number of years, the forgotten area; now it finds itself remembered with leftovers (26:18).

John Marean, Youth Education Consultant at the University of Nevada and Elain Ledbetter, Chairman of the Science Department at Pampa Senior High School, Pampa, Texas, state that the following problems are significant. They must be considered if an attempt is made to build an effective junior high school program in science.

First, children in early adolescence possess such

variations of interests, talent, and academic ability that no single treatment of any one body of scientific knowledge is likely to be successful with more than 50 per cent of the students for an extended period of study. Second, the evolutionary nature of scientific knowledge makes the content of formal science instruction subject to frequent and revolutionary change. Third, there is an increasing need for general education science learning on the part of all youth. It may serve to influence career choices and contribute to the intelligent exercise of the rights and obligations of adult citizenship, which these individuals will face in a few short years (26:18).

How, then, do audiovisual materials, techniques, and equipment help one teach science? The following discussion will relate the many ways audiovisual materials help to teach science.

Television has been accepted as an instructional tool by a great many educators during the past ten years (44:74). Particularly in science education, where lab equipment cost may be high, television provides a means for one well-equipped lab to be shared by many classes.

Also high on the list of audiovisual materials in science teaching is the motion picture. Special production techniques may greatly enhance the value of film as an instructional medium.

Time lapse photography allows long-term change to be shown in a short time. When the late Glenn Frank, former President of the University of Wisconsin, saw a film on time lapse photography, he described the experience as follows:

> Yesterday within the space of ten minutes, I saw a plant grow to full maturity, bear fruit, and die. As a child I often stood with awe before the mystery of plant growth and wondered what it might be like to see the actual processes of growth. . . I had to wait forty years to see it, but yesterday, the thing I wondered about as a child, happened. I saw the processes of growth as clearly and as plainly as this morning I see motors streaming by in the street below my hotel window. Conan Doyle had not come back to show me the varvels in a se'ance. I was not under the delusive spell of a magician. I was simply watching an educational film on plant growth (51:374-375).

Film is also able to record a rapid action and repeat it more slowly. Thus, slow motion photography gives the science teacher a means to permit detailed study of an action too fast for the human eye to perceive. Where repetitive viewing of a process is needed, the motion picture makes it possible.

Two other motion picture and still picture techniques which have a special use in science are microphotography and macrophotography. Microphotography shows the student enlarged projections of normally invisible microscopic life. Macrophotography is quite similar, except that the object would be normally visible to the human eye, but

would be too small for effective study until it is enlarged photographically.

The overhead projector serves the purpose of reaching a small group in the classroom or serving an entire auditorium of students. The transparencies can be purchased from commercial firms or locally produced to serve almost every unit in the teaching of science.

The purchase of microprojectors continues to increase at a rapid rate. By combining a microscope with a projection system, the microprojector allows small or large group viewing of plants and animals invisible to the naked eye. The effect of microprojection is the same as microphotography, except that it usually requires a totally darkened room if less expensive projectors are employed.

Models and mockups have a definite place in education at all levels. A classic example of one of the most noted scientific mockups was the giant superheterodyne receiver developed by the United States Navy for electronics instruction. A normal size chasis would be about seven inches by twelve inches, and could hardly be used for large group instruction. The mockup was about five feet by nine feet, and all parts were easily visible even in the largest classroom. Mockups may be operative, but this is not always necessary. Sometimes a mockup shows only one operational characteristic (44:124).

A model often helps bring abstractions down to concrete examples. Models take much time to construct but there are numerous commercial models to fill a science teacher's needs.

Not all AV materials are concerned with the visual. Some medical schools collect hearbeat recordings to help train future doctors (44:124). For schools, the sounds of nature--insects, birds, etc.,--are available on records.

There are numerous sponsored materials. They can be of immense use and value in providing authentic, up-to-date materials on a wide variety of subjects. Several large companies produce scientific films equal to none in film catalogs. The Humble Oil Company, and Bell System Office are two excellent sources of free, authentic material.

Field trips are excellent to use in science. Visits to factories and laboratories can serve students as a revelation of the part played by applied science in modern living. There is no better way in a nature study than an actual field trip.

Bulletin boards, exhibits and chalkboard diagrams also have a place in the teaching of science. They not only add interest to the unit and classroom but they very well might serve to explain a concept that the students are having difficulty in understanding.

Radio interviews with scientists, technologists, and industrial leaders who are using applied science to improve the mechanics of living can serve the useful purpose of interesting the young in science proper; and so can radio dramatizations of the lives of the great scientific originators and experimenters.

The laboratory experience perhaps is the most beneficial audiovisual technique in science. The student must investigate, draw his own conclusion, and apply this to his scientific world. Minimum requirements for a laboratory include flat-top working areas which may be individual student tables, larger flat-top tables or counter space, a source of alternating current, a supply of water, and a drain for the disposal of chemicals and solutions. The existence of available gas for burners is certainly desirable but not essential. Then there must also be space for the storage of laboratory equipment and materials and the short-range storage of individual student projects (26:20).

VIII. SUMMARY OF CHAPTER

In doing the careful planning for an audiovisual program there are various factors to be considered. A philosophy and purpose should be established for such a program and it should coincide with the general philosophy of the school.

The values of the program as listed in this chapter justify having an audiovisual program in the school.

The instructional materials center must contain specific facilities for effective utilization of audiovisual materials and research indicates that the materials and equipment should be centralized in one location. Without the suggested facilities in the center, the suggested services of the center cannot be obtained.

Probably the most important factor in a successful audiovisual program is effective administration of the program. The director must have basic qualifications if he is to carry out the duties and responsibilities of such a position. Because the duties are too numerous for one person to perform, an adequate number of personnel should be employed.

There are reliable guidelines to follow in planning a budget for audiovisual materials, but these guidelines are not a flat rule. A school district should spend as much as it can possibly afford.

Through research, audiovisual experts have formed recommendations on the number and kind of equipment that a school should contain. If the school has access to this equipment, the classrooms should be constructed to utilize it.

Locally produced materials have many advantages for the classroom teacher. They lend themselves to flexibility and creativeness on the part of the teacher. A local production center must be supplied with special equipment and should be included in an audiovisual program.

The audiovisual program has a definite place in the teaching of science. Almost every audiovisual material and piece of equipment can be integrated into the existing science curriculum.

CHAPTER III

PROCEDURES USED IN THE STUDY

I. OVERVIEW OF MORGAN JUNIOR HIGH SCHOOL

Morgan Junior High School is located in Ellensburg, Washington. The valley surrounding Ellensburg is largely farming and ranching land. The town is primarily dominated by Central Washington State College. Ellensburg lacks any large industry.

The junior high has grades seventh, eighth and ninth. The student body is approximately seven hundred and fifty pupils and the staff numbers forty-one, two counselors, a principal, and an assistant principal.

Science is taught one semester in the seventh grade and is continued for an additional semester in the eighth grade. The continuity through both grades is maintained by a topical guide. The guide attempts, through the learning and application of a small number of basic scientific theories and principles, to help students gain a better understanding of their environment. Learnings in earlier units are used continuously in subsequent units and new principles, theories, and factual data added as the succession of problems demand.

The broad objectives that the science teacher attempts

to achieve are as follow:

Objectives

Broad. To develop, practice, and acquire those attitudes, skills, habits, and basic bits of data usable in every day living.

Specific.

1. To learn a simple usable problem solving technique.
2. To acquire habits of self-discipline and self-direction.
3. To develop the essential communication, mathematical, scientific and social skills, habits, attitudes, and interests needed in modern successful living.
4. To practice habits of accuracy, clarity and brevity.
5. To appreciate the advantages of advance planning.
6. To be cautious about accepting ideas and information without adequate proof.
7. To develop an interest and an appreciation for the benefits science has given us in the past and can give us in the future with proper support.

8. To acquire a basic fund of pertinent principles, concepts and information directly applicable to an understanding of our total environment.
9. To become aware of professional opportunities in the science areas.

Techniques

The most commonly used classroom techniques are demonstrations, research work in several sets of texts, diagramming procedures, teaching and re-teaching with a variety of test types, oral reading with interpolated questions, comments, and discussion, and the use of science and guidance-films. Other techniques are employed wherever and whenever the uniqueness of a teaching problem demands.

One of the most promising techniques is the student laboratory sessions. In a student lab session it is the sincere desire of the school to provide an opportunity to give all seventh grade science students a beginning knowledge of physical science and to offer some insight into a means by which scientific knowledge is acquired.

II. MATERIALS, SOURCES, AND EVALUATION

A main development in modern education is the growth in the use of audiovisual instructional materials. These audiovisual materials can be divided into two large groups. The first group would consist of projected materials such as overhead transparencies, 8 mm and 16 mm films, filmstrips, opaque projections and slides. The projected materials are the more widely used of the two. The second group would be the non-projected materials such as models, mockups, bulletin boards, exhibits, tapes, records, etc.

These materials are available from the audiovisual libraries of Central Washington State College, Washington State University and the University of Washington. In addition to the materials available from these libraries, materials from Inland Audiovisual Company, Moody Institute of Science, and Encyclopedia Britannica Films will be evaluated.

An evaluation form was constructed and used to obtain an objective appraisal of the projected materials. Each projected material underwent a critical analysis to justify its usage in the light unit. Filmstrips, 16 mm films, and overhead transparencies were the projected materials evaluated.

The evaluation form consists of a two page combination format. In this particular format the physical aspects are evaluated using a checklist. It contains the necessary information, such as unit of study, source, producer, purchase or rental price, and type of sound. Learning outcomes which help students' achievement is also included. A synopsis of the audiovisual material is included on the first page of the format.

The results of the evaluation will be reported in Chapter IV with a complete unit plan for a model light unit.

The results of the evaluation of filmstrips are found in Appendix A. In Appendix B are found the evaluation results of the 16 mm films and the results of the evaluations of overhead transparencies is found in Appendix C.

The light unit was arbitrarily chosen from the various units in the seventh grade physical science curriculum. The unit was constructed as a model unit for the total utilization of audiovisual materials. The numerous approaches and utilization of audiovisual materials could easily be applied to other physical science units.

The light unit has been organized in the following manner. First, the conceptual scheme presents the desired concepts that the writer hopes to achieve with the unit.

The main objectives of the entire light unit will then be listed. Following the objectives will be a series of fifteen daily lesson plans. These plans will illustrate the daily allotment of time, the specific daily objectives, procedures, and student activities and the audiovisual materials used in the unit.

CHAPTER IV

INTRODUCTION TO LIGHT UNIT

Science instruction during the junior high school years varies a great deal. Instruction too frequently is of the textbook, recitation type, with little student experiementation or problem solving. Efforts to improve general science include curriculum revision, creating more opportunites for student problem solving activities, more adequate facilities and equipment, and finally, more effective, efficient, utilization of current audiovisual materials.

In the following light unit, the writer will illustrate how a teacher who has the necessary background in the realm of audiovisual materials can make a unit of study more meaningful, interesting, and beneficial to the student.

I. CONCEPTUAL SCHEME OF THE LIGHT UNIT

A. The Nature of Light

1. Light has many properties.
2. Light has two theories which can be used to explain its behavior.
   a. wave theory
   b. particle theory
3. Light has speed.

5. Light is affected by a transparent, a translucent and an opaque substance.

B. The Measurement of Light

1. The intensity of light can be measured.
2. The amount of illumination can be determined.
3. Illumination is affected by distance.

C. The Causes of Color

1. The solar spectrum and color are related.
2. Invisible light has a practical use.
3. Light is a part of the electromagnetic spectrum.
4. Primary colors and primary pigments are determined by light.

D. Changing the Direction of Light

1. Light changes direction when it strikes a mirror.
2. Light can be refracted.
3. Light can be reflected.
4. Lenses and mirrors can be used to reflect and refract light.
5. Tiny objects can be magnified, by the use of lenses.
6. Far away objects can be brought near by lenses.
7. The eye and the camera react to light.
8. The eye forms images.
9. The eye can see both near and far.
10. Lenses can be used to correct eye difficulties.

II. OBJECTIVES OF THE LIGHT UNIT

As a result of this unit the students will be able:

1. To identify through recitation and writing the nature of light.
2. To identify how light is affected by mirrors, lenses and prisms through the students' usage of the optical bench.
3. To learn what makes vision possible by the identification of the parts of a human eye as compared to a cow's eye.
4. To compare colors by the identification of primary pigments and primary colors.
5. To understand and list the properties of light.
6. To learn the intensity of light by solving mathematical light measurements in student labs.
7. To contrast the eye and the camera and how they react to light.

The text that the seventh grade uses is Matter, Life and Energy by Herron and Palmer, published by the Lyons and Carnahan Company. The book contains two chapters on light and serves primarily as a reference for the students.

III. LESSON PLANS

The following fifteen pages describe the daily lesson plans for the light unit. Each lesson plan is divided into five sections. They are: (1) amount of time, (2) daily objectives, (3) procedures, (4) student activities and (5) audiovisual materials.

LESSON PLAN - LIGHT UNIT

Lesson Number -(1) 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.	Recall and discuss facts known to students.	Introduce unit with emphasis on: (a) importance of light (b) study of light	Discussion	Textbook--Matter, Life and Energy.
15 min.	Introduce the nature of light.	Introduce and show film, Science of Light	View film	Film--Science of Light. Source: Wash. State Univ.
10 min.	Become familiar with properties of light.	Students read text pp. 369-371. Use vocabulary words on board as guideline.	Read text	Chalk board
10 min.	Become familiar with theories of light.	Discuss reading and vocabulary words using overhead transparency Sources of Light.	View overhead transparencies	Overhead transparency--Sources of Light. Source: Morgan Jr. Hi. Sch.
10 min.	Observe how light is produced artificially.	Review all materials presented.		

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, (2) 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday.	Discussion	Chalkboard
10 min.	Become familiar with speed of light	Read pp. 371-375.	Read text	Textbook
5 min.		Discuss speed of light		
15 min.	Realize how light travels.	Show film Speed of Light	View film and discuss film	Film--Speed of Light. Source: Morgan Junior High School
5 min.	Become familiar with light and how it is affected by various substances.	Discuss film		
5 min.		Discuss how light is affected by transparent, translucent, and opaque substances	Discussion	
10 min.	Observe polarized light.	Demonstrate polarized light.	View demonstration	Demonstration materials: light source polarized filters

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, (3,) 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5 min.		Read pp. 376-378	Read	Textbook
5-10 min.	Realize we can measure light.	Discuss text material on measuring the intensity of light	Discussion	Chalkboard
10 min.	Become familiar with terms used in measuring light	Show film--Measurement of the Speed of Light	View film	Film--Measurement of the Speed of Light. Source: Wash. State Univ.
5 min.		Discuss film		
10 min.	Realize we can determine intensity of light.	Explain how amount of illumination can be determined.		
10 min.		Demonstrate how amount of light can be determined in classroom	Observe	Demonstration materials: exposure meter classroom with lights on

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3,(4) 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.		Review from yesterday	Discussion	
5-10 min.	Determine unknown light sources	Introduce student lab by use of overhead transparency: The Bunsen Photometer.	View overhead transparency	Overhead transparency: The Bunsen Photometer. Source: Morgan Junior High School
30-40 min	Opportunity to work in lab situation	Student lab--determining an unknown light source	Participate in lab session	Student lab materials: optical bench 1 candle holder 4 candle holders 5 candles electric light holders for electric light clamps
Home study	Opportunity to work in a problem solving situation	Assignment: Answer questions concerning light lab	Home study	

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, (5) 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
10 min.		10-minute quiz		
5-10 min.	Become familiar with the Lumen	Introduce student lab by using overhead transparency--The Lumen	View overhead transparency	Overhead transparency: The Lumen Source: Morgan Junior High School
30 min.	Work in a lab situation Apply the problem solving technique Determine the lumens falling on an object	Student lab--determining lumens	Participation in student lab	Student lab materials: optical bench standard size candle photometry head electric light electric light holder

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, (6) 7, 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.		Discuss yesterday's lab	Discussion	
5 min.		Read pp. 379-381	Read	Textbook
5-10 min.	Gain skills in reading	Discuss reading and vocabulary words	Discuss and record vocabulary definitions	Chalk board
5 min.	Learn what causes color	Demonstrate the prism		
10-15 min	Observe the solar spectrum	Film: Nature of Color	View film	Film: Nature of Color. Source: C. W. S. C.
10-15 min	Understand what determines color	Review and discuss film via the bulletin board	Discussion	Bulletin board on color

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, (7) 8, 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5 min.		Read pp. 381-382	Read	Textbook
5-10 min.		Discuss reading	Discussion	
10 min.	Know how man uses invisible light	Demonstration: Opposite wave lengths at end of our spectrum	View demonstration	Demonstration materials: ultra and infrared light source luminous rock collection small motor-solar battery
20 min.	Be introduced to the electromagnet spectrum	Film: Spectograph	View film	Film: Spectrograph Source: C.W.S.C.
10 min.	Understand the various sources and forms of radiant energy	Study electromagnetic spectrum via a chart	View and discuss chart	Electromagnetic spectrum
5 min.		Review	Discussion	Demonstration sheets

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7,(8,) 9, 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.		Review from yesterday	Discussion	
5-10 min.	Know what makes up white light	Read pp. 382-384 Discuss reading	Read	Textbook Chalkboard
30 min.	Know what primary colors are Know what primary pigments are Opportunity to work in problem solving lab	Introduce lab session	Participate in lab session	Lab materials: paper paints--red, blue, yellow, green, etc sources of colored light paint brushes water
Homestudy		Answer questions on lab session.	Homestudy	Lab sheets

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, (9,) 10, 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5-10 min.	How to change the direction of light	Read pp. 387-390	Read	Textbook
5-10 min.	How images are formed	Discuss text and emphasize vocabulary words	Discussion	Chalkboard
5 min.	How angle of incident and reflection are related	Introduce student lab		Lab materials: ruler plane mirror graph paper protractor pencil
15-20 min		Student lab	Participate in student lab	
10 min.		Review findings using overhead transparencies	View overhead transparencies	Overhead transparency: Reflection, Plane mirror reflection Lab sheets

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9,(10) 11, 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.		Review from yesterday	Discussion	
5 min.	Know what happens when light strikes one substance into another	Read pp. 390-391	Read	Textbook
10 min.		Review reading emphasizing vocabulary words	Discussion	Chalkboard
30 min.	Become familiar with various types of lenses Use problem solving technique in lab session	Introduce and proceed with student lab	Participate in student lab	Lab materials: optical benches white cardboard holder small convex lens 1 large concave lens 1 small concave lens electric light source

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, (11) 12, 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5 min.	Become familiar with various types of lenses	Read pp. 391-392	Read	Textbook
10 min.		Review reading via discussion, chalkboard, and bulletin board	Discussion	Chalkboard Bulletin board
20-25 min.	Become familiar with reflection and refraction Have opportunity to illustrate achievement	View filmstrips: Light and How It Is Reflected Light and How It Is Refracted	View filmstrip	Filmstrips: Light and How It Is Reflected Light and How It Is Refracted Source: Morgan Junior High School
5-10 min.		Review with short quiz	Quiz	

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, (12) 13, 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5-10 min.		Review from yesterday	Discussion	
5 min.	Observe how tiny objects can be magnified	Read pp. 392-394	Read	Textbook
10 min.		Review reading		Chalkboard
20-25 min	Observe how distant objects appear closer	Introduce and proceed on student lab	Participate in student lab	Lab materials: optical benches white cardboard holder 2 convex lenses 2 concave lenses light source
5 min.	Become familiar with workings of a telescope	Review	Discussion	
	Participate in problem solving technique in lab session			Lab sheets

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, (13), 14, 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5 min.	Learn how eye reacts to light	Read pp. 394-398	Read	Textbook
10-15 min	Learn how camera reacts to light	Review reading emphasizing vocabulary words		Chalkboard
15-20 min	Learn how image is formed by eye Learn how we see both near and far	Demonstration: Pupil of an eye.	Observing and participating in demonstration	Demonstration material: mirror slide projector students' eyes eye glasses
5 min.	Observe how special lenses correct eye trouble	Review material	Discussion Begin preparing for final test	

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, (14) 15

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
5 min.		Review from yesterday	Discussion	
5 min.	Observe the anatomy of a cow's eye	Read pp. 398-399	Read	Textbook
10 min.	Compare cow's eye	Discuss reading		Chalkboard
20-30 min	to human's eye Formulate concepts on the functions of the eye	Introduce and proceed with student lab-- Dissecting cow's eye	Participate in student lab	Lab materials: dissecting pan dissecting kit cows' eyes
5 min.	Ues problem-solving technique	Review		

LESSON PLAN - LIGHT UNIT

Lesson Number - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, (15)

Amount of time	Objectives	Procedures	Student Activity	Audiovisual Materials
Total period	Opportunity to evaluate students' achievement Opportunity to evaluate teacher's objectives	Hand out test Read and explain directions Students take test	Taking test	Test

IV. EVALUATION OF MATERIALS

Overhead Projector

The following overhead transparencies are available from the sources indicated earlier. Of the twenty-one evaluated, eighteen are recommended and three are not recommended. Much emphasis has been placed on the overhead projector in the past few years. This is caused by the reduction in the initial cost of the machine.

Recommended	Not Recommended
Sources of Light	Light
The Human Eye	Eclipses
The Bunsen Photometer	Umbra and Penumbra
The Lumen	
Reflection of Color	
Three Primary Pigments	
Concave Lens Rays	
Angle of Refraction	
Convex Mirror Image	
Concave Mirror Rays	
Focal Point Ray Diagram	
Plane Mirror Reflection	
Parts of a Wave	
Projected Lens System	

Refracting Telescope Lens System

Real Images--Focal Length

Convex and Concave Lenses

Reflection

Filmstrips

Below are the names of five filmstrips that are recommended for the light unit. All of the filmstrips are in color and are a definite asset to a unit on light. These filmstrips are dated recently and illustrate the fact that much has been done in the area of equipping the science teacher with modern, up-dated material.

Recommended	Not Recommended
Light and Color	
Light and How it Travels	
Light and How it is Reflected	
Light and How it is Refracted	
Light	

16 mm Films

Of the fourteen films evaluated the writer found eleven that would meet the set standards and therefore be recommended for showing in the light unit. Most of the 16 mm films are in color and over half of them are dated prior to 1951.

Recommended	Not Recommended
Demonstration with Light	Introduction to Optics
Light and its Story	Learning About Light
Light and Shadow	Colour
Light Waves and their Uses	
Nature of Color	
Light and Color	
Measurement of the Speed of Light	
Photons	
Science of Light	
Speed of Light	
Spectrograph	

Summary on Projected Materials

The writer found sufficient choices in the selection of overhead transparencies, filmstrips and 16 mm films. There are no commercial opaque materials that could be incorporated into the light unit, however, pictures of cameras, telescopes, color charts and the parts of an eye could be utilized on the opaque projector or placed on bulletin boards. There are catalogs of 8 mm single concept films in science but there are none available for the unit on light.

Summary on Non-Projected Materials

There were no non-projected materials available from the sources that could be used on a unit in light.

Utilization of a Local Production Center

To most teachers, a local production lab means such limited activities as the production of graphic materials, mounting pictures, preparing lettering aids for exhibits, and making tape recordings. These techniques are a part of the local production lab but the lab provides numerous other facilities which should motivate the teacher to create various other materials.

Although the Ellensburg School District lacks a local production center, the writer will attempt to illustrate how a science teacher could use such a center.

In respect to overhead projectors, instructional uses are particularly dependent on locally prepared transparencies. The versatility of the overhead projector and the simplicity of the thermofax machine could easily be incorporated for more effective teaching. Quick, easy-to-use transparency-making equipment supports and even encourages greater use of the overhead projector.

Developments in photographic equipment also contributes to the potentialities of local production activities. Simplified slide-making cameras and related

automatic slide projectors with remote controls have proven to be the needed stimuli for many teachers to engage in the production of slides and slide series for their teaching.

The potentialities of the 8 mm films for local production is just beginning to be realized by educators. From the single concept cartridge projector, to the magnetic sound projector, and soon to the 8 mm optical sound projector will come many possibilities for broadening local production activities.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

I. SUMMARY

This study was undertaken to: (1) identify and investigate the current standards of an effective audiovisual program; (2) identify and evaluate the rationale which can be used in determining the basis for the utilization of audiovisual materials in the field of science education; (3) use this rationale as a basis for selecting appropriate audiovisual materials for the seventh grade physical science curriculum in Morgan Junior High School; and (4) develop recommendations concerning the utilization of audiovisual materials in Morgan Junior High School, in Ellensburg, Washington.

The literature pertaining to audiovisual programs in public school districts was reviewed in Chapter II. The first factor which must be considered to establish an audiovisual program is the philosophy and purpose of the program. This philosophy should coincide with the general philosophy and needs of the school. The administering of this program should be performed after the identification of the needs of the teaching facilities. Besides the philosophy and purpose of an audiovisual program, the

values and functions of such a program were investigated.

Literature concerning the audiovisual center was reviewed. It was found that such a center must have specific equipment and materials and a well organized physical arrangement if it is to provide the proper service to the faculty.

The administration of a program was discussed; the qualifications, duties and responsibilities of the director defined; the number of personnel needed for an effective program and their responsibilities; and finally, the budget and the amount of school money appropriated for audiovisual materials.

A list of equipment that should be housed in an audiovisual center was presented as suggested by leading authors in the field of audiovisual education. It was found that every classroom should possess specific facilities, equipment and materials; the plan being that every classroom should be an audiovisual room.

There was further discussion of the kinds of materials needed for an effective audiovisual program, and how some could successfully be produced locally. Suggested from the literature reviewed were efficient methods of cataloging and scheduling materials.

It was found that audiovisual techniques and materials serve a valuable function in the teaching of science. Almost every piece of audiovisual equipment and numerous audiovisual materials can be incorporated into the science curriculum. The laboratory experience is perhaps the most beneficial audiovisual technique in science.

From the review of literature in Chapter II, the writer formed a basis for utilizing audiovisual materials in a science program. Chapter III contains the procedures the writer used to evaluate audiovisual materials for science, or more specifically, seventh grade science and a unit on light. The types of materials used in the unit, their sources and an explanation of the evaluation form used by the writer are included in Chapter III. Also an overview of Morgan Junior High School is presented in Chapter III.

A model unit on light for the seventh grade level is presented in Chapter IV. The unit utilizes numerous audiovisual materials and some locally produced materials. It is the writer's intent to show how various audiovisual materials can be integrated into daily lesson plans for more creative and effective teaching.

II. RECOMMENDATIONS

Based upon the findings in the review of literature and the construction of the model unit on light, the writer recommends the following:

1. All audiovisual materials and equipment presently unavailable at Morgan Junior High School and identified in this study, be purchased to make the model light unit a reality.
2. The basic procedures and methods of evaluation be used as a basis for revision of other units of science.
3. A study be undertaken to identify the audiovisual needs of the faculty and a correction of existing problem areas.
4. All audiovisual equipment and materials at Morgan Junior High School be centralized in one location of the building.
5. There be single session workshops, preferrably at the beginning of the school year to acquaint the teachers with the audiovisual center and teach them how to operate various machines.
6. Adequate facilities and materials listed in Chapter II be included in an audiovisual program.

7. A qualified director be placed in the audiovisual program with an adequate number of personnel under him such as secretaries, clerks, and projectionists.
8. There be ten 16 mm projectors to use in Morgan Junior High School.
9. There be fourteen slide and filmstrip projectors at Morgan Junior High School.
10. There be five opaque projectors housed at Morgan Junior High School.
11. There be five record players at Morgan Junior High School.
12. There be eight tape recorders at Morgan Junior High School.
13. There be one overhead projector per classroom, one out of every two capable of projecting $3\frac{1}{4}$" x 4" slides.
14. There be at least four radios in Morgan Junior High School.
15. There be three 8 mm projectors in Morgan Junior High School.
16. There be one permanently mounted screen per classroom, plus four portable screens for individual or small group usage.

17. Each classroom be made an audiovisual room by following the suggestions in Chapter II.
18. A local production lab be created and emphasis placed on constructing individual teaching materials applicable to specific units in the various subjects.
19. The School District make arrangements with the local television cable company for the installation of the necessary cables and receivers for students to view special programs.
20. The School District obtain a substantial number of commercial transparencies and 8 mm single concept films made available in various subject matters.
21. Models or other audiovisual materials be constructed by students in the various classes and housed in the audiovisual production center to be disseminated for later use.
22. Teaching machines and programmed and scrambled texts be used whenever they might benefit the students.
23. The school system obtain various new products such as a Switchcraft "listen-craft" Laboratory and allow interested teachers to work these products into their curriculum.

The writer realizes that the budget in the Ellensburg Public Schools is limited concerning audio-visual materials and equipment. The National Defense Education Act, however, provides considerable sums of money for the development of these materials. With the proper use of this money and the appointment of a qualified audiovisual director, great strides can be made toward more efficient and effective teaching within the school system.

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APPENDIX A

PROJECTED MATERIAL

EVALUATION

Title Light and How It Is Reflected

Unit of study Light **Material type** Filmstrip

Length _____ **Minutes** 53 **Frames Source** Morgan

B/W _____ **Color** X **Producer** Society for Visual Education

Purchase price $ 6.00 **Production date** 1964

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed X

Synopsis of audiovisual material.

Plane; concave, and convex mirrors are discussed. Terms defined include incident ray, reflected ray, center of curvature, divergence, focal point, and light ray. Includes questions.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound: None available

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.8

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

PROJECTED MATERIAL

EVALUATION

Title Light and How It Is Refracted

Unit of study Light **Material type** Filmstrip

Length _____ **Minutes** 44 **Frames Source** Morgan

B/W _____ **Color** X **Producer** Society for Visual Education

Purchase price $ 6.00 **Production date** 1964

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed X

Synopsis of audiovisual material.

Describes refraction in general, refraction by lenses, uses of lenses and optical instruments. Defines concave, convex, retina, prism, spectrum. Includes questions.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound: None available

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.8

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

APPENDIX B

PROJECTED MATERIAL

EVALUATION

Title Measurement of the Speed of Light

Unit of study Light **Material type** 16 mm

Length _____ **Minutes** 7 **Frames Source** W. S. U.

B/W X **Color** _____ **Producer** McGraw-Hill

Purchase price _____ **Production date** 1952

Rental source W. S. U. **Rental price** $ 2.10

Recommended level K __ P __ I __ J __ S X C X

Type of sound

Background X **Dialogue** _____

Narration X **Silent** _____

Learning outcomes which help student achievement

Specific facts presented _____

Basic ideas presented X

Interest increased X

Generalizations formed X

Synopsis of audiovisual material.

Fitzeau's toothed-wheel method described with aid of moving light beam; Michelson's modification of the method, reflecting a light beam from a rotating eight-sided mirror.

Technical Quality:

Use of good camera technique:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	9 (10)

Use of animation and illustrations:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	(8)	9 10

Sound:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	(9) 10

Educationally Well Produced:

Continuity:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	(8)	9 10

Thought provoking:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	(9) 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9

OVER-ALL EVALUATION:

Poor		Fair			Good			Excellent
0 1	2	3	4	5	6	7	8	(9) 10

PROJECTED MATERIAL

EVALUATION

Title Nature of Color

Unit of study Light **Material type** 16 mm

Length _____ **Minutes** 10 **Frames Source** C. W. S. C.

B/W _____ **Color** X **Producer** Coronet

Purchase price _____ **Production date** 1946

Rental source C. W. S. C. **Rental price** $ 3.50

Recommended level K __ P __ I __ J X S X C X

Type of sound

Background X **Dialogue** _____

Narration X **Silent** _____

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed _____

Synopsis of audiovisual material.

Re-enaction of Newton's explanation of the mystery of the rainbow; principles of color reflection, absorption; primary, complementary colors; mixing of colors by addition and subtraction; applications of color in painting; color printing, color photography.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 8.9

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

PROJECTED MATERIAL

EVALUATION

Title Science of Light

Unit of study Light **Material type** 16 mm

Length _____ **Minutes** 11 **Frames Source** W. S. U.

B/W _____ **Color** X **Producer** Churchill-Wexler

Purchase price _____ **Production date** 1960

Rental source W. S. U. **Rental price** $ 2.80

Recommended level K __ P __ I X J __ S __ C __

Type of sound

Background X **Dialogue** _____

Narration X **Silent** _____

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed _____

Synopsis of audiovisual material.

Combines animated drawings with a boy's experiments to explain vision, how light is transmitted, reflection, absorption, and refraction.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	(7)	8	9 10

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 8.5

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

PROJECTED MATERIAL

EVALUATION

Title Spectrograph

Unit of study Light **Material type** 16 mm

Length _____ **Minutes** 20 **Frames Source** W. S. U.

B/W _____ **Color** X **Producer** McGraw-Hill

Purchase price _____ **Production date** 1955

Rental source W. S. U. **Rental price** $ 4.10

Recommended level **K** __ **P** __ **I** __ **J** __ **S** __ **C** X

Type of sound

Background X **Dialogue** _____

Narration X **Silent** _____

Learning outcomes which help student achievement

Specific facts presented _____

Basic ideas presented X

Interest increased _____

Generalizations formed _____

Synopsis of audiovisual material.

Advanced. Principle of spectrometer and spectrograph; Bohr theory and application of emission and absorption spectroscopy; application to astronomy, metallurgy, biological research, criminal findings.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 8.9

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

PROJECTED MATERIAL

EVALUATION

Title Speed of Light

Unit of study Light **Material type** 16 mm

Length _____ **Minutes** 14 **Frames Source** C. W. S. C.

B/W X **Color** _____ **Producer** Encyclopedia Britannica

Purchase price _____ **Production date** 1954

Rental source C. W. S. C. **Rental price** $ 3.00

Recommended level K __ P __ I __ J X S X C X

Type of sound

Background _____ **Dialogue** _____

Narration X **Silent** _____

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed _____

Synopsis of audiovisual material.

Modern day four-engine plane being "talked down" to a landing in a heavy fog. Flash back to Galileo, Roemer, Fizeau and his light chopper; Michelson's Mt. Wilson Experiment.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	(7)	8	9 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 8.7

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	(8)	9 10

APPENDIX C

PROJECTED MATERIAL

EVALUATION

Title Plane Mirror Reflection

Unit of study Light **Material type** transparency

Length _____ **Minutes** _____ **Frames Source** Morgan

B/W X **Color** _____ **Producer** Inland Audiovisual

Purchase price $ 1.50 **Production date** 1965

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased _____

Generalizations formed _____

Synopsis of audiovisual material.

Explains reflection and demonstrates angle of incidence and angle of reflection with animated diagrams. Simple explanation of refraction and practical application of refractions. Transparent, translucent, opaque explained.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.5

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

PROJECTED MATERIAL

EVALUATION

Title Reflection

Unit of study Light **Material type** transparency

Length _____ **Minutes** _____ **Frames Source** Morgan

B/W X **Color** _____ **Producer** Inland Audiovisual

Purchase price $ 1.50 **Production date** 1965

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed X

Synopsis of audiovisual material.

Elementary principles of light; principles of reflection with plane, concave and convex mirrors.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.5

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

PROJECTED MATERIAL

EVALUATION

Title Sources of Light

Unit of study Light **Material type** transparency

Length _____ **Minutes** _____ **Frames Source** Morgan

B/W _____ **Color** X **Producer** Inland Audiovisual

Purchase price $ 5.50 **Production date** 1965

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased X

Generalizations formed _____

Synopsis of audiovisual material.

Illustrates general properties and sources of light. Could be used as an introduction to the light unit.

100

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.5

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

PROJECTED MATERIAL

EVALUATION

Title The Bunsen Photometer

Unit of study Light **Material type** transparency

Length _____ **Minutes** _____ **Frames Source** Morgan

B/W X **Color** _____ **Producer** Inland Audiovisual

Purchase price $ 1.50 **Production date** 1965

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased _____

Generalizations formed _____

Synopsis of audiovisual material.

Illustrates the basic idea of intensity and illumination. Would be excellent as an introduction to the student lab on lumens.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.1

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

PROJECTED MATERIAL

EVALUATION

Title The Lumen

Unit of study Light **Material type** transparency

Length _____ **Minutes** _____ **Frames Source** Morgan

B/W X **Color** _____ **Producer** Inland Audiovisual

Purchase price $ 1.50 **Production date** 1965

Rental source _____ **Rental price** _____

Recommended level K __ P __ I __ J X S X C __

Type of sound

Background _____ **Dialogue** _____

Narration _____ **Silent** X

Learning outcomes which help student achievement

Specific facts presented X

Basic ideas presented X

Interest increased _____

Generalizations formed _____

Synopsis of audiovisual material.

Explains and illustrates the unit of measurement for light. This understanding essential for effective student labs.

Technical Quality:

Use of good camera technique:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Use of animation and illustrations:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Sound:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 10

Educationally Well Produced:

Continuity:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Organization:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	(9) 10

Thought provoking:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

Complete with review:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)

AVERAGE TECHNICAL AND EDUCATIONAL RATING 9.5

OVER-ALL EVALUATION:

Poor			Fair			Good			Excellent
0	1	2	3	4	5	6	7	8	9 (10)