

THE USE OF AUDIO-VISUAL  
AIDS IN THE SCIENCE CURRICULUM

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## CHAPTER I

### INTRODUCTION

The development of mass communication has had a great influence upon advancing civilization. Probably the greatest influence is the dissemination of knowledge to a wide public. The accumulation of written knowledge of generations was available to all with the development of the printing press. Our religious, economic, political and social life is affected by many aspects of communication.

Throughout life we are both students and teachers and as such, our primary job is to be able to communicate effectively. We are always teaching someone something.

Usually the most effective type of learning is gained by concrete experiences. We are often unable to give students first-hand experiences and resort to the use of words, written and spoken. With the wise selection and use of a variety of audio-visual materials, experiences can be provided that will develop understandings and enhance thinking.

The terms "visual aids" and "visual education", while they have served to classify a group of teaching aids into a systematic scheme of instructional materials, have been unfortunate in that they have tended to set these materials apart from the more commonly used classroom teaching tools and aids. Being concrete in nature, they are valuable in the enrichment of experience and in the provision for the growth of meaning essential to verbal experience. They are neither less nor more

important than text-books, than lecture and discussion, than supplemental reading. They have their functions and their values and they should be considered in relation to other teaching materials in terms of what may be done with them in attaining the objectives of instruction. Of course their use may be over-emphasized and their value exaggerated.

#### PURPOSE

The purpose of this study is to ascertain various phases of the administration of the audio-visual program, and the utilization of these teaching aids in the presentation of curriculum material.

#### DEFINITIONS

There are a number of terms which need to be clarified for interpretation of this material. If school instruction is to become more purposeful and meaningful, audio-visual aids must be used to enrich and vary the pupil's concrete experience. What, then, are audio-visual aids?

Audio-visual aids. The definition of "audio-visual" as defined by McKown and Roberts<sup>1</sup> states that because there are so many misinterpretations of audio-visual instruction, the elimination at the beginning of the most common of these misinterpretations will make the positive definition better understood. The following negative statements are discussed:

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<sup>1</sup>Harry C. McKown and Alvin B. Roberts, Audio-Visual Aids to Instruction (New York: McGraw-Hill Book Co., Inc., 1949), p. 3.

Audio-visual instruction is not a separate school subject.

Audio-visual instruction is not a substitutive educational device.

The audio-visual movement is not concerned only with motion pictures, either silent or sound.

Audio-visual instruction is not mere entertainment.

Audio-visual instruction was not invented by the armed services of the United States.

Audio-visual instruction is not new.<sup>2</sup>

From the above negative statements, McKown and Roberts then give their positive definition of audio-visual instruction.

"In short, these aids are supplementary devices by which the teacher, through the utilization of more than one sensory channel, helps to clarify, establish, and correlate accurate concepts, interpretations, and appreciations."<sup>3</sup>

Krug has defined audio-visual aids by saying that these aids serve the function of enriching and clarifying learning through the use of the sensory avenues of the eye and ear, and that they represent a more direct and less symbolic approach to transmission of ideas than is possible in the reading process.<sup>4</sup> And Dent defines visual-sensory aids as "all materials

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<sup>2</sup>Ibid., pp. 3-8.

<sup>3</sup>Ibid., p. 12.

<sup>4</sup>Edward A. Krug, Curriculum Planning (New York: Harper & Brothers, 1950), p. 211.

used in the classroom or in other teaching situations to facilitate the understanding of the written or spoken word".<sup>5</sup>

Charles F. Hoban, James D. Finn and Edgar Dale have defined audio-visual aids as those aids which, when properly used in the teaching situation, can supply a concrete basis for conceptual thinking and thus reduce meaningless word-responses of students. Visual aids have a high degree of interest; they make learning more permanent; they stimulate self-activity by making experiences more real; they develop continuity of thought; and they provide experiences which contribute to the efficiency, depth, and variety of learning.<sup>6</sup>

For the purpose of this report the definition shall be that an audio-visual aid is any model, object, picture, demonstration, field trip, or device which may provide a concrete sensory experience to the learner for the purpose of introducing or clarifying abstract concepts, to develop desirable attitudes, and to stimulate further activity on the part of the learner.

Motion Pictures. The motion picture provides for the projection of the individual into the movie situation, the selectivity and continuousness of the portrayal of activity on the screen, and the dramatization of events and situations on the screen. Motion pictures may be silent or accompanied by sound.

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<sup>5</sup>Ellsworth C. Dent, Audio-Visual Handbook (Chicago: Society for Visual Education, Inc., 1946), p. 1.

<sup>6</sup>Edgar Dale, Audio-Visual Methods in Teaching (New York: The Dryden Press, 1955), p. 65.

They may be in black and white or in color. Motion picture film may be either 16 millimeter size or 35 millimeter size. The majority of films for classroom use are in the 16 millimeter size. Sound films run at a faster frame-per-second rate than the silent films. The rate for sound films is 24 frames per second. The rate for silent films is 16 frames per second.

Projected still pictures. Many objectives of instruction do not necessitate the inclusion of motion and action in experience. The film strip is a roll of film carrying positive images produced by direct printing from the negative print. It is a collection of prints having the advantage of projection which makes it more desirable for group study and instruction. It is considerably smaller in size than any corresponding pictorial means with a comparable number and variety of pictures.

The single-frame picture or slide refers to a single frame from a filmstrip or a roll of film. The single frame is mounted and may be projected on a screen.

Flat, unprojected pictures include photographs, prints, paintings and stereographs. Among the most universally used aids, flat pictures are popular because they are real and vivid, provide motivation, are easily available, convenient to use, inexpensive, and can be used repeatedly.

Graphic materials are representations which are highly symbolic. In themselves they mean little or nothing. Objects, ideas and principles are represented pictorially by colors,



figures, lines and numerals. In order to understand graphic materials, we must understand the meanings and applications of these symbols.

Objects are the things themselves--such as animals, trees, books. Specimens are only parts of the objects--such as paper and wood. Models include replicas of the objects--such as trains, airplanes, and boats.

Auditory aids include those devices which are sound aids to instruction--such as the phonograph, radio, television, sound amplification, and the centralized sound-distribution system.

School trips and tours are school exercises designed to provide a sensory experience relative to such phenomena as cannot be brought into the classroom. They involve the conduction of pupils to places where the subject matter of instruction may be studied to the greatest advantage.

#### JUSTIFICATION OF THE STUDY

Science courses should be organized and presented so as to leave the students with a desire to continue the study because a deep and abiding interest has been engendered. Such interest may be purely avocational, but as machines continue increasingly to supplant human labor, hobbies and leisure-time pursuits begin to assume greater importance in education as they do in life.

The establishment of such interests comes through the power a teacher often possesses of infecting others with his

own enthusiasm. Many times a great love for nature study may spring up independent of such a source, but it may develop through another media such as a trip to a museum or zoo, or by the reading of some fascinating book dealing with exploration, discovery, or invention. The teacher must see to it that his students are put in the way of experiencing a variety of contacts that may provide the necessary stimulation.

In preparing a science course we must determine which of the fundamental attitudes toward life and human environment, attainable through science study, are most essential to the educational process of the student. Along with setting up objectives should be the cultivation of abilities and special skills needed commonly enough to be worth developing. We need to cultivate those abilities and skills connected with study and investigation, including the systematic ordering and arranging of information collected, and the employment of this mass of organized knowledge in arriving at intelligent conclusions and new knowledge. These in turn will tend to lead the student toward true intellectual independence.<sup>7</sup>

Probably the most important objective, and yet the one concerning the attainment of which we know the least of all, is the development of what is known as the scientific attitude. This includes the general point of view from which the scientist should approach problems not only in his own field but in his relations to life as a whole. Included among the

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<sup>7</sup>Preston, Carleton E., The High School Science Teacher and His Work, (New York: McGraw-Hill Book Co., Inc., 1936), p. 52.

characteristics of that attitude are a passion to discover the truth, no matter what traditions may be upset in the search; basing judgment on facts rather than on opinions and of realizing that all sources of evidence are not equally dependable; the willingness to change one's own belief when presented with new evidence; to recognize the universal relation between cause and effect; the attaining of habits of suspended judgment and of tolerance which will allow room for differences of opinion and interpretation. Individuals who possess this attitude will intelligently make his own decisions and abide by them until new evidence causes him to modify them.<sup>8</sup>

#### SUMMARY

In this chapter the scope of the audio-visual program has been discussed, and the responsibility of the teacher stressed. The purpose with which this study is concerned was explained and justified.

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<sup>8</sup>Ibid., p. 53.

## CHAPTER II

### ORGANIZATION OF MULTI-SENSORY AIDS

The intensified training program brought about by the war gave a timely impetus to the use of various interest-getting devices which caused concentration of attention and thereby accelerated learning.<sup>1</sup> The highly effective results of modern training methods were attested by the success of our armed forces on all fronts. All this did not happen magically but under the considered guidance and planning of those who were familiar with visual training techniques. "What films actually did was to improve the quality of the training program in the allotted time."<sup>2</sup>

Training by audio-visual aids is popularly defined as teaching with pictures, particularly with sound movies and filmstrips.<sup>3</sup> The old Chinese adage about one picture being worth ten thousand words lends validity to the current use of such techniques. If we give a child a good idea or a good model of what is to be done or learned, the process of learning may be facilitated.<sup>4</sup>

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<sup>1</sup>McKown and Roberts, op. cit., p. 6.

<sup>2</sup>Charles F. Hoban, Jr., Movies That Teach (New York: The Dryden Press, 1946), p. 38.

<sup>3</sup>John R. Miles and Charles R. Spain, Audio-Visual Aids in The Armed Services (Washington, D.C.: American Council on Education, 1947), p. 2.

<sup>4</sup>Arthur I. Gates, Psychology For Students of Education (New York: The Macmillan Co., 1931), p. 346.

Learning experiences are meaningful when they are related to the student's interests and when they are involved in his living.<sup>5</sup> Gates continued that learning cannot be successful or efficient without persistent selective and purposeful effort, and there is no more important problem than that of motivation.

"Material to be learned must necessarily be presented to one or more of the sense organs of the subject."<sup>6</sup> The sensory mechanisms are our continuing contact with our world of things and events; and the eye, the ear, the nerve endings which respond to pressure, to heat and cold, and to odors and tastes are the means through which almost all learning is accomplished; they are the means of perception.<sup>7</sup> The learner gains understanding in terms of multiple impressions recorded through the eye, ear, touch, and other sense organs.<sup>8</sup> Gates states that "other things being equal we learn quite as readily through one sense as another with the exception, of course, of individuals whose receiving, connecting, or central mechanisms are defective".<sup>9</sup> McGeoch reported that the use of both visual and auditory stimulation in combination has usually been found to

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<sup>5</sup>Ibid., p. 307.

<sup>6</sup>John A. McGeoch, Psychology of Human Learning (New York: Longmans, Green and Co., 1953), p. 480.

<sup>7</sup>Walter A. Wittich and Charles F. Schuller, Audio-Visual Materials, Their Nature and Use (New York: Harper & Brothers, 1953), p. 18.

<sup>8</sup>Ibid., p. 19.

<sup>9</sup>Gates, op. cit., p. 339.

be superior to the poorer of the two when they are used separately and to be superior, in some cases, to either one.<sup>10</sup>

Miles and Spain state that multi-sensory instructional aids afford a means of capitalizing upon individual differences and an appeal to all the senses may give confidence to some pupils who feel inferior in employment of verbalizations.<sup>11</sup> In addition, such aids can bring the remote near and lend a sense of reality to many academic situations.

Greater reliance upon multi-sensory teaching materials should rest upon a clear conception of the proper use of these materials in the classroom; and the teacher should understand how to use such materials effectively in relationship to the entire program of instruction.<sup>12</sup> The utilization of these training materials must be considered in the light of the tendency of students to want to learn as well as of instructors to want them to learn.<sup>13</sup>

There are two fundamental criteria for the selection or preparation of all types of visual materials: (1) they must provide an accurate representation of reality or they will simply lead the individual to acquire incorrect meanings; and (2) they must be used as means, and not as ends in themselves.

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<sup>10</sup>McGeoch, op. cit., p. 481.

<sup>11</sup>Miles and Spain, op. cit., p. 87.

<sup>12</sup>Ibid., p. 80.

<sup>13</sup>Ibid., p. 49.

In other words, they are visual aids.<sup>14</sup>

Visual aids may develop interest and motivate the pupils' learning in several ways such as the following: (1) they are relatively easy to understand because they are concrete; (2) they cause the child to focus his attention on them; (3) they provide the child with opportunities to handle and manipulate; and (4) they satisfy immediate curiosity. McKown and Roberts conclude by stating that "a well capitalized sensory aid, then, not only satisfies a definite lack that the pupil feels, but at the same time causes him to feel new lacks".<sup>15</sup>

In view of the values of multi-sensory aids, their use may help classroom instruction. An audio-visual program which provides a variety of aids to teachers will help to facilitate the learning process. One of the teaching aids which appeals to both sight and sound is the motion picture. This device has been widely used for classroom instruction.

Hoban<sup>16</sup> relates that one of the major contributions of the war-training to the educational motion picture was the enlarged concept of the purposes for which films can be successfully employed in a broad educational program. Further, he states that the effective use of films in education begins with the film producers, not with the teacher, and that films must be produced so as to facilitate good use. "Good teach-

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<sup>15</sup>McKown and Roberts, op. cit., pp. 33, 34, 35, 47.

<sup>16</sup>Hoban, op. cit., p. 21.

ing with films means good teaching methods in the films."<sup>17</sup>

The Committee on Educational Research of the Payne Fund<sup>18</sup> made a study of the influence of motion pictures upon children and youth. The study, designed to secure data which would make possible a more complete evaluation of motion pictures, was in two groups: one, to measure the effect of motion pictures upon children; the other, to study current motion picture content. The conclusions were: (1) the motion picture is a potent factor in education; (2) the child gains many facts from the motion pictures, and he remembers these facts for a long time; (3) attitudes toward social problems are changed by the motion picture; and (4) motion pictures arouse the emotions.

The value of motion picture films when used in the classroom has also been studied.

Baker,<sup>19</sup> in his investigation to determine the effectiveness of motion picture films, found that motion pictures when used with a definite film technique were more effective than the oral teacher-pupil summary. He added that indiscriminate use of films in the classroom contributes little or nothing to the learning process, but that when films are used

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<sup>17</sup>Ibid., p. 85.

<sup>18</sup>W. W. Charters, Motion Pictures and Youth (New York: The Macmillan Co., 1933), p. 60.

<sup>19</sup>M. K. Baker, "An Experimental Study of the Effectiveness in Teaching General Science", Educational Screen, XXII (June, 1943), 27.



with a technique, they have a value.

An experimental study was conducted by Cobbs<sup>20</sup> to determine the value of motion pictures in teaching three natural science units to grades one, two, three and four. The results showed that the average scores of the experimental group, who had used sound films as supplementary teaching material, excelled those of the control group, who had every privilege except the use of the sound films. In conclusion, his results indicate that sound films were valuable as teaching aids in presenting science to primary children.

Some values of the motion picture film were shown in the above investigations, and it is through studies such as these that we become aware of the beneficial part the motion picture film plays in education. By using the motion picture and other sensory aids, the classroom no longer remains isolated from the rest of the world. Now the sights and sound of countries halfway round the world are brought within its walls. At first sight, this use of sensory aids would seem to indicate that the role of the teacher is merely that of a spectator or projectionist; however, this is not the case, "for audio-visual methods of instruction require on the part of the teacher greater effort and responsibility".<sup>21</sup>

Unless the organization and administration of the audio-

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<sup>20</sup>C. T. Cobbs, "Use of National Science Sound Films in Primary Grades", Educational Screen, XX (February, 1941), 57.

<sup>21</sup>I. G. Hosack, "Organizing an Audio-Visual Program in High School", Audio-Visual Guide, XIX (January, 1953), 31.

visual program gives considerable attention to making visual aids available, much of the real educational value may be lost. "Best results come when the materials are picked with discrimination for specific purposes, and thorough preparation is made for their use."<sup>22</sup>

The effective teacher in the democratic American school is effective just in the degree that he has made himself expert in the communication of facts and ideas to learners. What he broadly desires is, of course, to be an inspiring leader of the young. He wants to help them come alive to their best opportunities and to guide them into experiences that will give their minds something to grow on. These are indispensable and noble aspirations but in themselves they are more than a little useless-tall talk in a vacuum. Such talk does not answer the crucial questions of how and what. We can assume the worthiest motives in the teacher, but practical expertness in communication we cannot assume. It has to be built, and the ground on which it must be built is his general disposition to use to the fullest extent whatever instructional procedures are capable of presenting facts and ideas vividly and truthfully.

Many teachers have assumed that the audio-visual formula was the answer to everything, and they had to discover by disillusioning experience that it was something short of that. There are no foolproof methods in teaching. Any method has

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<sup>22</sup>V. M. Rodgers, "Organizing and Administering the Audio-Visual Aids Program", School Executive, LXIV (September, 1944), 56.

to be carefully thought through, with anticipation to the snags that are bound to turn up, and sensory aids rashly invoked or heedlessly applied are perhaps even more liable to disappointments than the older traditional procedures.

Teaching by means of such aids demands a teacher thoroughly prepared for effective presentation. And it must be a presentation of feasible materials. The audio-visual device misused by someone who has failed to foresee the end from the beginning will contribute less to education than to frustration. Projectors are all right, but there must be alertness and competence behind the projector.

#### SUMMARY

A review of the literature revealed fundamental criteria for the selection and utilization of various types of materials. The learner gains an understanding in terms of multi-sensory impressions, and we should utilize these materials to present a sense of reality to the academic situation.

## CHAPTER III

### MULTI-SENSORY AIDS

Audio-visual methods cannot be substituted for by a textbook, lecture or demonstration course. The teacher has to manipulate instruments and try out materials to develop competence in their use. He must become expert in sizing up the teaching tools applicable for his subjects. It takes experience to know whether pictures, models, or other devices have real value, stimulus, and expository merit. A teacher must learn to gauge in advance the effectiveness, for a given group, of the materials that are supposed to outline a general concept, develop an understanding, or summarize an idea. And he has to acquire a feeling for timing these helps to occasions when his pupils are particularly receptive and hence responsive.

The teacher who has won this confident mastery has a special power of bringing reality, not to say drama, into the classroom. And it is also of importance that they have prepared themselves, quite incidentally, to be of great help to school administrators about acquisition of teaching apparatus and to audio-visual manufacturers about designing it.

From the earliest times that we know about, man has used the walls of his houses for graphic expression. In his prehistoric caves he drew pictures of animals and hunters. In Egyptian and Babylonian temples, tombs, and palaces he painted symbolical murals. He designed friezes for his public buildings in Rome and Greece. Today he uses the sides of barns,

warehouses, and billboards to pictorialize the virtues of various commodities.

A convenient vehicle of illustration, diagram and announcement, the signboard is the most universally used of all visual aids. Any teacher will admit that it is one of the most valuable of teaching tools. He will also admit that he does not use it well enough.

In secondary schools most teachers need large amounts of chalkboard space for semiformal matter useful to their classes. Experienced teachers do not need to be told that the chalkboard is a superior means of getting and holding the attention. Pre-eminently lucky is the teacher with a knack of drawing cartoons or fluent sketches, an accomplishment irresistible to pupils.

Chalkboards are valuable in at least four ways, according to McKown and Roberts;<sup>1</sup> (1) because of size and location it can be utilized for group instruction; (2) opportunities are provided for pupil activity; (3) writing and drawing on chalkboards intensify pupil interest and attention; and (4) chalkboards are economical because they can be erased and used over repeatedly.

All chalkboard representations should be definitely and immediately purposeful. Meaningless "doodlings" are distracting and confusing and show evidence of the teachers lack of skill in chalkboard work.

In spite of the universal use of the chalkboard, it is

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<sup>1</sup>McKown and Roberts, op. cit., p. 128.

not without its limitations. Some of the limitations as noted by Kinder<sup>2</sup> are as follows: (1) pupils have to turn in their seats to see material on side or rear chalkboards; (2) writing is at times not visible to all parts of the room; (3) teachers and pupils demonstrating at the chalkboard often obscure their very illustration by standing in front of it; and (4) dust from chalk may cause skin and throat irritations.

A classroom becomes a much more effective and lively workshop when it has an adequate assortment of display boards and makes an energetic use of them.

Bulletin boards are used by many teachers to arouse interest in a topic, to sustain the interest aroused, and to conclude and sum up the pursuit of the topic. Pictures and other graphic material provide a good introduction to a new subject. Committees of pupils in charge of bulletin boards keep them up to date with materials constructed by students themselves or taken from magazines, newspapers, or manufacturers. These displays deepen the students interest and center their thinking. Another value as noted by Kinder<sup>3</sup> is that the bulletin board may act as an agency for socialization through group effort in arranging displays and also in the care of the bulletin board. In order to achieve its values the bulletin board must be conveniently located. It should be in a well-lighted space and at a height corresponding to the eye level of the

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<sup>2</sup>James S. Kinder, Audio-Visual Materials and Techniques, (New York: American Book Co., 1950), p. 81.

<sup>3</sup>Ibid., p. 82.

pupils.

The modern school has greatly broadened and transformed the demonstration. Previously, the demonstration was conceived as a lecture in which scientific instruments and materials were used to expound natural laws and processes. Demonstration was thought of as being an alternative to laboratory experimentation. Now, we have come to perceive that they ought to be in collaboration with each other. The laboratory puts its emphasis on individual work, done by experimentation, while the demonstration is essentially a means of communicating something to a whole group. Laboratory work is of course indispensable to the teaching of the basic techniques and skills of scientific research, but the demonstration is equally effective, or sometimes more effective, for teaching basic comprehension of a principle or a process. Both are important, both necessary.

Learning should be, as far as possible, not merely studying about things, but experiencing the things themselves. It should be made up of real situations.

The teachers who are convinced that sensory experience is the basis of all learning will make a generous use of objects, specimens, and perceptual means generally. They need no argument for the desirability of teaching habits of observation through things that have color, texture, form, smell, or weight. Teachers who are skeptical of this theory, or who are temperamentally inclined to favor academic above audio-visual methods, will not utilize the object lesson. They will protest that a

given object is too bulky, too heavy, or too valuable to be brought to the classroom. Teachers, like everybody else, act in accordance with their personalities. The ones who are sympathetic to audio-visual methods use them, and the ones who are unsympathetic resist them.

Perceptual means should be used from the beginning to the end of the education process, but they should also be supplemented. The virtue of any single device is reinforced by the use of other devices. All of the methods of teaching added together will be none too many, and the good teacher is the one with the flexibility to utilize all of them in turn and with the sensitivity to know at a given moment which one will produce the best result.

Materials of the realia group include real or authentic things. Realia include items such as objects, specimens, samples, relics, artifacts, souvenirs, models and dioramas.<sup>4</sup>

A relatively new method of preserving or mounting specimens might well be mentioned here because of its superiority to the pinning method or other similar methods. The method consists of imbedding small specimens in molten plexiglas, a moderately hard, glossy plastic. Such specimens as bones, insects, frogs or grains can be imbedded in a block of transparent plexiglas. The specimen is then almost exempt from being broken, all sides are exposed to view, and it may be handled and passed around safely. One disadvantage lies in the fact

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<sup>4</sup>Ibid., p. 333.



that the student does not get his hands on the specimen to feel its actual surface texture. The preparation of specimens in this manner also serves as a good project for the ambitious student.

The high school biology room should be equipped with a fresh water aquarium. This serves as a practical arrangement to keep small fish, snails, tadpoles, water-scavenger beetles and aquatic plant life such as is found along the edges of ponds and streams. Live specimens are available from the aquarium for observation and study, microscopic slides can be prepared from the spirogyra or other substances in the water. Many forms of microscopic life are always available.

There is much value in bringing specimens into the classroom for study, yet some things can be more appropriately taught in their natural environment. Botanical and zoological specimens can be brought into the classroom but it is generally desirable to take the students into the field to observe materials in their natural habitat. Mounting, preserving, classifying and labeling are important activities which should accompany such collecting.

The educational tour may be defined as an educational procedure in which pupils are conducted, for educational purposes, to places where the subject matter of instruction may be studied first hand in its functional situation.<sup>5</sup>

Both Aristotle and Socrates used the trip method; Comenius

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<sup>5</sup>Hoban, op. cit., p. 30.

recommended it; Pestalozzi and Rousseau promoted the technique; and the greatest Teacher of all times used this method to teach the people. The emphasis on learning first hand from nature or from the original source was well versed by Alexander Pope in his lines:

"Go, from the Creatures thy instructions take:  
Learn from the birds what food the thickets yield;  
Learn from the beasts the physic of the field;  
Thy arts of building from the bee receive  
Learn of the mole to plow, the worm to weave;  
Learn of the little Nautilus to sail,  
Spread the thin oar, and catch the driving gale."<sup>6</sup>

The educational and cultural potentialities of the educational tour are manifold. They are not units of study in themselves; they are the means to an end. They tend to provide more meaning for topics of study by enriching experience and vitalizing classroom work.

Kinder<sup>7</sup> states that the values which are emphasized by the school journey are changing from the mere accumulation of facts to appreciations, meanings and attitudes concerned with the various economic, social, scientific and cultural phenomena. The chief objective of education, wholesome citizenship, must be based on an intelligent interest in and knowledge of, the various elements of one's environment.<sup>8</sup>

Much of the usual curricular work of the school is formal

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<sup>6</sup>Maynard Mack, "The Poems of Alexander Pope", An Essay On Man, III (New Haven: Yale University Press, 1951), p. 110.

<sup>7</sup>Kinder, op. cit., p. 403.

<sup>8</sup>McKown and Roberts, op. cit., p. 251.

and academic and may be said to lack vitality. The average bookish description of a sewage plant, the hospital laboratory, the chemical manufacturing plant, are unappealing to the average student, because they are remote from reality. Hence, they are difficult to understand. Of course, book accounts are necessary, but when they are supplemented by actual experience, students receive quite different experiences.

The worth-while educational tour is never a hurried or unplanned journey. It must be a carefully thought out, planned educational experience. A successful trip will promote the healthy development of this device, but an unsuccessful trip will discourage it.

Local educational tour possibilities should be obtainable from the school system, but if such a listing is not available, one may be started. A survey of the immediate community should first be taken listing all possibilities. The listing and later evaluation of these potential destinations will be valuable when future trips are considered. Pre-trip planning should include a student committee, who with the teacher may visit the destination, collect pertinent information concerning it, the educational values it may offer, age, grade level, and subjects to which it is best suited, and mechanical arrangements such as transportation and time appropriate for visitation. After each trip, an evaluation should be made, both by the teacher and the students. The journey assignment should develop naturally out of the class setting. It is but one phase of the

experience and must be based on good principles.

Auditory Aids. Sounds are threads which are woven into all phases of the fabric of living. We would have no speech, no music, no warning of danger without sounds. We have always counted on sound to furnish a large part of our education with such developments as television, radio, telephone, telegraph and records. We must understand how sound is produced, transmitted, recorded, reproduced and heard. It is not necessary for the teacher to become a master of electronics, but the basic principles should be understood in order to make the most effective use of the modern audio tools of communication.

In the short period of sixty years, radio has grown from a gadget in Marconi's workshop to a necessity in the majority of American homes. Radio is an integral part of the lives of the school children of today. No longer is radio only an outside influence on the lives of young listeners, but has become a potent educative force.

Radio listening, whether conducted in or out of school, contributes immeasurably to the student's fund of information. It exerts an influence upon their attitudes and appreciations, social behavior, and their ability to discriminate and develop critical thinking. Radio provides also for self-motivation and creative expression.

Outside the classroom, most people consider the radio as diversion or entertainment rather than as education. Educational aspects are secondary, although a few people naively believe that listening to quiz programs enhances the listener's

knowledge. With many families the radio is tuned in and left on for long periods of time. Listening under such conditions is decidedly passive. Of course, listening to all types is an important avenue for learning, but active intelligent home listening to the radio is apparently much neglected.

The recording and reproduction of music, voices and other sounds has made an important contribution to our educational program. We can bring such real sounds into the classroom as the song of the meadowlark, the screech of the horned owl, or the soft murmur of the mountain stream. Hearing brings another dimension of learning into the educational program, and all of this can be accomplished by recording and reproduction equipment.

Generally speaking, nearly all the values of instruction by radio can be ascribed to instruction by phonograph records. Naturally, the latter cannot bring news flashes, but they can bring instructional lessons just as effectively as the radio. The phonograph can be used at any time and for any length period. It can be used at the psychological moment when it is most needed and when it will be most effective in aiding instruction. In general, two main values stand out, flexibility of use and greater permanence.<sup>9</sup>

The central sound system is a composite of many different types of audio equipment integrated into an organized program. It includes facilities for radio reception, recording, record

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<sup>9</sup>Kinder, op. cit., p. 511.

and transcription playing, and all types of local production. It allows for the channeling of any program material to any, all, or a series of classrooms simultaneously. The core of any central sound system is the control panel usually located in or near the principal's office. This control panel is the distribution point for all program material. Most complete central sound systems include provisions for intercommunication with classrooms and provisions for amplification of programs originating in the auditorium, gymnasium or orchestra room. The potential educational value of the central sound system, should not be underestimated.

Television is, without doubt, the most dynamic, exciting means of communication. It has an immediacy which can span time and space and bring to the viewing audience miles away exciting historical events in the making. Even greater reality in this medium may be expected with the advent of color television.

Television, the same as other instructional tools, must be carefully used to obtain the best results in the classroom. Most educational television stations provide a study guide for use with an educational program or series of programs.

It hardly needs to be said that if the television program does not contribute to the course of study, it should not be viewed by the class. Only those programs which make a major contribution to the course should be used.

Closed circuit television is not telecast through a television station but is for use only in the immediate vicinity.

It is of value when a group of students could not be assembled to watch the actual demonstration, and is then transmitted to one or more receivers.

The use of educational television is practically unlimited for adult education. Programs have been produced to take up when the school program left off. We are on the threshold of a new way of education and learning which can affect our entire way of life and contribute a great deal to the cultural growth of our country.

Photography. Every teacher should own a camera of some kind. Photography seems particularly applicable as a teaching device for clarifying concepts and providing motivation. Learning by looking is effective and interesting. The taking and study of pictures make the young really see what is around them. They become more aware of beauty and ugliness and more observant of life.

In the classroom, experiments in the biology class may be recorded photographically. Athletic and health classes can use the camera to reveal poor posture or athletic clumsiness. The geometry teacher can easily find applications of his subject to arouse interest.

The contribution of photography is obvious. Advertisers know the value of a good picture. Educators are realizing its value both as a teaching medium and as a vocational and avocational instrument.<sup>10</sup>

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<sup>10</sup>Kinder, op. cit., p. 327.

Opaque Projector. One of the greatest handicaps in using pictures, illustrations, sketches, diagrams or other flat materials in the classroom lies in the fact that they are too small to be seen by many at one time. This handicap is easily overcome by projecting the material in an opaque projector.<sup>11</sup>

Opaque projection is designed to show for group use non-transparent material like text selections, photographic prints, maps, postcards and certain kinds of flat specimens. These materials are reflected as images on a screen by means of mirrors in the projector.<sup>12</sup>

The greatest value of the opaque projector is its ability to project a wide variety of materials which students and teachers have prepared or collected. Color can be shown in its original application.

The chief disadvantages to the use of the opaque projector are: (1) the room needs to be well darkened; (2) the projector becomes quite hot after prolonged projection, even those equipped with a fan; and (3) the opaque projectors are large and cumbersome, although not heavy.<sup>13</sup>

Micro-projection is an efficient and useful device and is of great service in connection with work in which the individual microscope is used. Teachers have always been concerned about what the pupil saw when he peered into a microscope. This pro-

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<sup>11</sup>Ibid., p. 180.

<sup>12</sup>Hoban, op. cit., p. 175.

<sup>13</sup>Kinder, op. cit., p. 183.



blem is solved when use is made of the micro-projector because the view is then flashed on a screen. Economy is also achieved because with a micro-projector it is unnecessary for each student to have a microscope.

Slides may be prepared for projection and life aquatic specimens may also be projected. Protozoa project easily. Circulation of the blood in the distended foot of the frog or in the tail of a fish can be projected to the screen. Demonstrations can also show the effect of disinfectants or germicides on living matter. Capillaries, veins, and circulation take on new meaning when seen in reality.

Filmstrip. The silent filmstrip is one of the more commonly used projected media. It will probably be found in more classrooms than most other types of projected pictures. The popularity of the filmstrip is due to several factors: first, the low cost of the filmstrips; and secondly the lightweight, inexpensive projectors for showing this type of material.

Color film makes it possible for one to record the subject in all its natural beauty. The addition of color not only makes the picture more pleasing and attractive but more realistic. This element of realism in the colored picture on the screen makes it one of the most valuable of teaching aids.<sup>14</sup>

Silent filmstrips are growing in popularity and general use. They are exceedingly flexible in use and are excellent for prolonged study and discussion. The filmstrip is not a

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<sup>14</sup>McKown and Roberts, op. cit., p. 159.

succession of disassociated slides, rather it should be thought of as an adaptation of the silent motion picture, because of its continuity in both pictorial and verbal presentation. Silent filmstrips are effective in presenting many activities. This medium capitalizes upon the elimination of irrelevant and often distracting motion by showing only the pertinent characteristics of each detailed step in a procedure.<sup>15</sup>

The filmstrip is usually designed to be a complete and self-contained teaching unit made up of components in logical sequence. The teacher should preview it, both to make sure that it will have real value to the class and to plan the best way of presenting it. The preview will suggest how the class is likely to respond and also how the filmstrip can be coordinated with other teaching devices and supplementary activities. No filmstrip at all is better than one that does not fit a definable purpose.<sup>16</sup>

Motion Pictures. No single communicative medium in the world's history has so universally influenced human behavior as has the motion picture. The extent of the motion picture's social influence was carefully traced in a series of studies carried on under a grant from the Payne Fund. In these studies an attempt was made to measure the effects of the theatrical motion picture on children's emotions, on attitudes, patterns of morality, on juvenile delinquency, and on other phases of

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<sup>15</sup>Kinder, op. cit., p. 175.

<sup>16</sup>Sands, Lester B., Audio-Visual Procedures in Teaching (New York: Ronald Press Co., 1956), p. 293.

human behavior. From these studies the first conclusion was that the motion picture is a powerful medium of education; the second, that children learn a large number of facts from a motion picture and remember them for a surprisingly long time; the third, that motion pictures produce a measurable change in attitudes toward social problems; and fourth, that motion pictures powerfully stir the emotions.<sup>17</sup>

Motion pictures are not moving pictures at all. These pictures are a succession of still pictures. Still pictures are photographed on a film, each picture being called a frame. Motion picture film is slotted on one or both sides and a series of sprockets engage these slots and pull the film through the projector, not in a steady movement but in a stop and start action. The projector brings a frame of the film to a point between the lens and the light and the image is thrown on the screen for a fraction of a second, a still picture. While the film is moving from frame to frame there is no image on the screen yet these pictures are brought into focus so rapidly that there appears to be a moving image on the screen at all times.<sup>18</sup>

Motion pictures, like all audio-visual materials, must be correlated with other curriculum materials. Teachers must keep in mind the purposes for which films are to be shown. These purposes are manifold. The following steps as given by

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<sup>17</sup>Hoban, op. cit., p. 94.

<sup>18</sup>Kinder, op. cit., p. 206.

Kinder<sup>19</sup> are characteristic as to a more meaningful and efficient utilization of motion pictures.

1. Plan to use the classroom instead of the auditorium. Proper learning attitudes are best promoted by remaining in the regular classroom.
2. The motion picture must be used at the psychological or logical time which fits the purpose for which the film is being used.
3. Teacher preparation for the use of the film is essential. This includes preview and study of the film content.
4. Prepare the class for the film. Students should know why the film is being used, what to look for, and how to integrate with material and learning which has already taken place.
5. Show the film. It should be accomplished as a regular process without a holiday atmosphere. Films must be taught, not just displayed.
6. Adequate follow up material must accompany each film to justify its use in the classroom.

The function of the motion picture has been to overcome limitations of time, space, and human vision. In these functions the motion picture stands without an equal among the visual aids, and is unapproachable as an instructional device outside of the field of visual aids. The major part of the film is devoted to natural photography, and animation, time-lapse, or slow-motion are used when they are particularly needed to amplify or clarify the material presented first by natural photography. The motion picture in slow motion depicts unobservable action which takes place too quickly, too slowly, too minutely, on too broad a scale, or in such physical relation

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<sup>19</sup>Ibid., p. 211.

as to be invisible to the unaided human eye.

By virtue of its motion, the motion picture, silent or sound, is nearer to reality or to the observational end of the learning process than any other visual media. Once the film is started the impressions succeed each other without any possibility for distractions or diversions. The most serious limitation of the motion picture is its controlled, uninterrupted tempo. The students must perceive and conceive at the tempo of the film rather than at their own rate. Naturally films are produced with the rate of the moderately slow learner in mind, but in some instances it will be necessary to compensate for this rate difference. Another limitation that might be placed on some motion pictures is the lack of opportunity for conceptual solidification. If the film permits the formation of several concepts, it is necessary to reserve discussion on all of them until the film is completely shown.

The sound motion picture amplifies the reality of the observation. The potency of the perception is also increased. In addition, mechanical sound provides permanent uniformity of presentation for no visual or auditory stimulus should be forgotten or omitted. The sound motion picture always puts on the same performance for every class. However, this very advantage may also be a limitation in some instances. The mechanical sound presupposes a specific objective and a specific vocabulary. Classes may have specific requirements that vary from those for which the film was intended.

The silent motion picture provides the teacher with greater

latitude in directing the preceptions toward the specific class requirements. But it provides this latitude at the expense of reduced emotional appeal and a less rigidly controlled presentation. In addition, the teacher is confronted with the task of synchronizing the explanation with the visual presentation.

Sources of Materials: Most teachers realize that free instructional materials are obtainable from many industries and organizations, but as they are often unfamiliar with the sources of these teaching aids, the following overview of references and suggestions is offered. These references to free and inexpensive materials have become standard sources for those who use sponsored materials in their programs:

1. Guides to free and inexpensive materials.
2. Free materials from museums and libraries.
3. Sources of materials in periodicals.
4. Federal government departments and agencies.
5. U. S. Government films for school.
6. U. S. Office of Education publications.
7. Trade indexes and buyer's guides.
8. Free materials directly from industry.

#### SUMMARY

This chapter contains the basic and characteristic descriptions of the various media commonly utilized by the science department. While, nevertheless, much more could have been written about these and other media, it was felt by the writer that this was adequate for the average science department.

Various primary sources of free and inexpensive materials was indicated to be of value to the teacher.

## CHAPTER IV

### SUMMARY

The effective use of audio-visual materials includes constant examination of both materials and techniques of utilization in the light of current needs. There must be a careful matching of the technique of utilization to the type of material used. After all, the materials do not think, we must do the thinking about when and how to use them. We cannot always use materials in the same way with different age or interest groups. The best material ever made will fall short of the mark if not properly introduced.

The main reason for using teaching devices is that they can do so much for us in our work with boys and girls, and that they have so much to offer as aids to the interpretation of curriculum content.

The question of instructional materials for instructional needs is one revolving around a dual process. The materials must be basically sound and convey information that is factually correct. They must do it in a way that will arouse interest and help to interpret facts which are presented. The viewer or user must bring to the material a readiness for it or he can hardly appreciate what it has to offer.

The wisest thing for us all to do is to stop emphasizing the unique solo properties of any one medium and to consider the ways in which all can contribute to the various curriculum



problems and pupil needs. The greatest array of material devices is here only to serve the human needs. That, in the final analysis, is the guide to follow in the selection of any and all materials used in our classroom.

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