Hoban, C.F.; Hoban, C.F. Jr.; & Zisman, S.B. (1937).
Why visual aids in teaching. In *Visualizing the curriculum* (pp. 3-26).
New York: The Cordon Company.

CHAPTER I: WHY VISUAL AIDS IN TEACHING

At teachers college Class in educational psychology had completed the study of the various methods by which individuals escape from the mental distress of emotional conflicts. One of these methods was designated and discussed as "escape," or "going out of the field." From the students' answers the instructor felt certain that they knew that one way by which conflict is eliminated is to leave the physical environment in which the conflict was produced. Thus, to escape mental distress produced by intolerable home conditions boys often resort to running away joining the army, etc., etc.

A few days later the class was asked to write a short paper on the problem of truancy as it is related to the psychology of emotions. To his enlightenment, the instructor found that only five out of twenty students in the class saw any relation between the concrete "escape" situation of truancy and the abstract psychological principles expounded in class for the previous two weeks. He discovered that *verbalism* exists on the college level.

I. VERBALISM IN EDUCATION

A. At the risk of creating just such a learning situation as this discussion is designed to prevent, *verbalism may* be defined as the generic term applied to the use of words without appreciation of the meaningful content of the words or of the meaningful content of the context in which they are used. It is to eliminate this *verbalism* from the results of school instruction that this book is written. .

B. *Forms of Verbalism.* Verbalism may assume anyone of many forms. For instance, if one sense of meaning is known, but if words are used in another and different sense, the outcome is verbalism. . The story is told of an assessor in rural Northwestern Pennsylvania who was rebuked by the owner of a goat for the assessment of the animal as real property subject to taxation. The assessor arose in what he considered just wrath and quoted' with righteous dignity the law which stated that any property "bound in' and abuttin'" on the streets of the town should be assessed on the basis of front footage.

Messenger, J. J. Franklin. *An interpretative history of education. New York, 1931),* pp.213-14

In the case of the assessor, the words had meaningful content, but that meaning was wrong in their particular usage. The background of experience upon which "bounding and abutting" were interpreted was limited to one concrete meaning, whereas their meaning in relation to the boundaries of real property was totally different. Such usage constitutes another form of verbalism. Another example is found in the story related by Messenger. A small city-bred girl went to visit a woman in the country. For the first time in her life the girl observed a cow chewing her cud in the shade of an evergreen tree. .After watching the behavior of the cow for some time, she went into the house and said to the woman, "Your cow is out under the Christmas tree chewing

gum."

Verbalism is not confined to college students, rural assessors, or small girls. It is prevalent wherever an abstraction is used without there being also a rich and varied background of concrete experience.

Yowell. Stella. Are Children Reading?" *Journal 0/ Educational Research*, 15: 1-4.

Its prevalence among high school students in the form of wrong usage, faulty interpretation, or downright misinformation is shown in a report of high school students' knowledge of outstanding characters "that appear in children's literature in the field of realism, mythology, history, and fancy," The students were asked to describe outstanding characters selected from the books which city and rural librarians reported as most widely read by children.

Some of the answers were clever, many humorous, and a few pathetic. The child who said, "Sinbad was a very sinful man," evidently believed it better to have guessed and lost than not to have guessed at all. The replies will give the reader an idea of how the children responded to the test. In some cues it is easy to trace an analogy, in others there seems to be no connection whatsoever between the correct answer and the one given. Some of the incorrect answers are:

1. Ulysses was a general in the American army.
2. Ichabod Crane had a wife who beat him up.
3. Tiny Tim was a boy about the size of a thumb.
4. The Duchess are people who come from Holland.
5. Minerva is the wife of Andy Gump.
6. Heidi was the evil side of Dr. Jekyll.
7. Friday was Robinson Crusoe's dog.
8. Atlas was a man who made maps.
9. Kit Canon is the man in *The Covered Wagon*
10. Miles Standish was a Pilgrim who lost his girl; a lady's man; traitor in the American Revolution.
11. Aladdin was Enoch Arden's friend.
12. Joan of Arc built an arc and saved all the people from a flood.
13. Peter Pan is a rabbit; a movie star.
14. King Arthur was the author of many books; the first man to *own* a round table.

In the above report of errors. many forms of verbalism can be seen. As a result of insufficient differentiation of characters who, though distinct, are in some way similar, all sorts of confusions are evident. Ichabod Crane is mistaken for Rip Van Winkle; both are the literary, relations of Washington Irving. Joan of Arc stands in juxtaposition to Noah because of the identical sound in ark-arc. As for the identity of Atlas, the pupil has thought that the model of earth which Atlas held on his shoulders was made by Atlas himself. The name of the mythological goddess of learning is known only through her namesake of the comic strip. In every case, insufficient experience and consequent insufficient differentiation may be given as a cause of verbalism.

C *Then and Now.* While it might be expected that the improvement in school instruction in the past hundred years would result in a material reduction of verbalism on the part of pupils, unfortunately this is

not generally true. Some reduction has resulted from changing emphasis on objectives of instruction, but verbalism is still all too common a product of American schools.

Nearly a hundred years ago the officials of the Boston schools decided to measure the results of instruction through a series of written examinations. The findings were cataclysmic in their exposition of verbalism as a product of instruction. Among the comments of the survey committee. on the efficiency of instruction in 1845 were the following:

Quoted from Caldwell, Otis W., and Courtis, Stuart A. *Then and NOW in education,* 1345: 1923 (New York, 1924), pp. 53.34.

It should be remembered that the Boston tests were administered only to the cream of the crop of the Boston Grammar Schools in 1845. Had the tests been administered more widely the results would probably have been even more astounding.

The careful observer will learn by looking over the tables, the general system of instruction pursued in our schools; namely, that of verbal or book knowledge. Generally speaking, the questions which, would be asked by one who teaches from books, as the names of the principal lakes, rivers, etc., are answered correctly, but take such questions as this:---Do the waters of Lake Erie run into Lake Ontario, or those of Ontario into Erie?-and 287 answer correctly, while 130 answer it incorrectly. Now, if we tab into consideration what is unquestionably true, that many of those who did not know answered end by guess, and that they were just as likely to guess right as wrong, much of the largest proportion (68%) of our best scholars could. not tell which way the waters run, in spite of all the fame of Niagara.

In history, the scholars have, for the moat part, learned to recite the words of the textbook, without having been accustomed to think about the meaning of what they have learned. . . .

In definitions, some of the answers were so supremely absurd and ridiculous, that one might suspect the boys of attempting to jest with the Committee, were it not that there are marks of honest attempts to trace analogies between words which they did know and words which they did not know. Many of the children were probably set upon the chase after their meanings for the first time, and it was not strange if they should make great mistakes.

When the same tests, or some form of them modified to meet the present school curriculum, were given to pupils in the eighth grade of the Detroit public schools in 1919, a marked improvement in general and in certain specific learning outcomes was noted. The percentage of wrong answers was, however, still alarmingly high. For example, some of the absurd definitions of *monotony* made in 18.t3 included "a song sung by one person," "the bones of human animals," and "thickheaded," whereas in 1919 the absurd definitions included "to get a divorce," "something we learn," and "a study which is taken up in college." A conclusion reached from the repetition of the 1845 tests in 1919 was that "the efficiency of present instruction, even at its best, although higher than in 1845, is still far from satisfactory."

The teacher in service, or the teacher in training for that matter, needs no evidence from scientific studies to recognize the prevalence of a type of learning confined largely to the more or less facile use of words without a corresponding richness of concrete meaning. She has only to observe the responses of her pupils in everyday school situations to realize that what was true in 1845 is also true under our present

methods of instruction. The bookish type of learning, the memorization of textbook material, the drilling on number facts and multiplication tables and the subsequent prevalence of errors in number processes furnish readily available evidence that something is radically wrong with methods of instruction which make responses such as these the products of teaching.

Wherein, then, does the fault lie?

D. *Causes.* In part verbalism is the result of instruction on an abstract level-a level which makes no provision for the depth and variety of concrete experience necessary to live richness of meaning of the abstraction. The age-old dictum – the *concrete precedes the abstract* -- has been so readily accepted as obvious that its full significance and its full application to learning-situations have been almost universally overlooked in school instruction. To restore it to its proper place, the proposition must be restated in these terms: *if the abstraction is to possess a richness of meaningful content, the concrete must precede the abstract in breadth, depth, and variety toward progressive stages of abstraction.*

Philosophers and psychologists have long recognized the relation *of* the concrete to the abstract, but it remained for Brownell to demonstrate the principle in its progressive stages in school learning. He set out to determine experimentally the mental processes used by children in arithmetic in the primary grades. From his interviews with primary children and his examination of the mental processes employed in their attacks on problems in arithmetic he concluded that under present methods of instruction children

> learn a series of number names purely on the basis of rote memorization and have little or no realization of the full meaning of the words. Many children of five or six years of age who can "count" to 10 are unable to identify the number of six objects when these are laid before them. The numbers exist for them only as so many words. School practice generally concedes the necessity of a closer relation between number names and concrete materials and provides some training with a view to establishing this relation. Yet much of the early school instruction in number is of little more merit than is home instruction in counting. Children in school are taught abstract terms and gain no adequate concept of the meaning of these terms. For instance, the pupil learns "4 plus 4 equals 8," and yet, when he is asked to apprehend the visual concrete number :: :: he counts by 1's; that is, he fails to apply his abstract knowledge because he fails to interpret the abstract formula and to apply it to the concrete situation. For him there is little relation between concrete number and abstract number because the latter has not been developed out of the former in a way which permits him to pass from one to another in his thinking.
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> Brownell, William A. "Development of Children's Number Ideas in the Primary Grades." *Supplementary Educational Monographs, No.* 35. University of Chicago. 1928.

To remedy the defects in teaching arithmetic Brownell suggests that Instruction in the lowest grades in school be carried on much longer with concrete material and with semi-concrete material (pictures, dots, etc.-representations of concrete objects) so that pupils may be led more easily and more gradually into abstract number. "Failure in teaching and in learning at the beginning stages *of* number is cumulative in its evil consequences; if the foundation is weak, the whole structure is weak," concludes Brownell. "The factor of meaning is central in the whole problem *of* learning and instruction in primary number."

What Brownell has demonstrated in his research on the development of the abstract number ideas in the primary grades and in subsequent research in methods *of* teaching these abstractions, applies in general to all school instruction involving the development of abstractions.

The principle upon which teachers depend for the development of abstract skills is that of drill. When drill fails more drill is prescribed. Yet drill in abstractions can result only in verbalism unless the drill has been preceded by orderly and progressive development of abstract concepts through various stages of concrete experience.

A recent investigation of the effects of drill administered before the abstract number ideas were built up through concrete experience has established this fact: the percentage of pupils employing elementary processes, such as counting and guessing in solving addition sums. was only slightly reduced despite persistent drill in addition combinations on the abstract level, i.e., the silent, written, and oral repetition of the verbal formulas such as "4 plus 4 equals 8." In other words, "drill makes little, if any, contribution to growth in quantitative thinking by supplying maturer ways of dealing with numbers." The result of verbal instruction without previous and adequate concrete experience along progressive stages of development from the concrete to the abstract results in the product of verbalism. The words lack meaning.

It should not be concluded, however, that drill has no place in school instruction. The principle involved is this: drill on learning material of an abstract character without the previous development of abstract concepts is a mere vocal exercise and of value only as such.

On the other hand, an investigation of the effect of using concrete materials and later representative concrete materials (pictures, etc.) in teaching second grade arithmetic shows strikingly different results of instruction.

Deana. Edwing. "The Effect of the Meaning' Method of instruction in Teaching Second Grade Arithmetic." Unpublished A.M. thesis. Duke *Uni*versity, 1935.

The orderly and progressive use of concrete materials resulted in an increased interest_in arithmetic. Children asked, "Is this arithmetic? This kind of arithmetic's fun. I like it better'n any kind." They found in school instruction a type of mental activity which was fun to them. It constituted no insurmountable barrier to school success. Rather it was arranged in accordance with the children's ability and with their rate of learning. As a result of this type of instruction the level of quantitative thinking was raised through progressive 1evels. Furthermore, the method was applicable to large as well as small groups. Finally it resulted in a transfer of training in which the processes learned in one situation were applied to the solution of new problems. The use of concrete materials in a systematic manner in the development of abstractions was found (1) to be interesting to children. 1:2} to be within the range of their ability, (3) to raise t*he* level of their thought processes, l4) to be applicable in teaching large groups, and (5) to result in transfer of training.

E. *Recapitulation.* The prevalence of verbalism as a product of school instruction in the past and in the present has been indicated. The hypothesis has been advanced that verbalism results from abstraction

based on inadequate concrete experience. The cause of failure in arithmetic, derived from a study of the development of abstract number ideas and processes, has been set forth. The inadequacy of verbal drill as a cure has been discussed. . And the results of systematic instruction through visual aids have been enumerated. The solution of the problem of verbalism lies in the introduction of concrete teaching materials as the basis of experience out of which may develop the meaningful generalizations and insights which are objectives of teaching.

II. VISUAL AIDS AVAILABLE FOR TEACHING

I f school instruction is to become more meaningful, visual aids must be used to enrich and vary the pupil's concrete experience. What, then, are visual aids?
Most people are quick to answer: motion pictures. To be sure, motion pictures are valuable visual aids, but they are by no means the only visual aids available to the classroom teacher_ nor are they the ones most widely used in current school instruction. Neither are lantern slides or other mechanical devices which involve the projection of a picture on some flat surface, preferably a screen, the only other visual aids. On the contrary, the motion picture and the lantern slide are just a few of the many visual aids available.

A visual aid is any picture, model, object, or device which provides concrete visual experience to the learner for the purpose of (1) introducing, building up, enriching, or clarifying abstract concepts, (2) developing desirable attitudes, and (3) stimulating further activity on the part of the learner. For convenience these various visual aids have been classified as (A) the school journey, (B) museum material, (c) motion pictures, (D) still pictures, (E) graphic materials. Many other classifications have been made, but whatever the method of classification; the same visual aids are involved.
The progression in the classification adopted and used throughout this book was made on the following basis. Visual aids are classified according to general types along a scale of concreteness and abstrac*tion.* For instance, motion pictures .treated before graphic materials are discussed, not because motion pictures are more available to teachers than maps and charts, but because they are more concrete. Similarly, museum materials are generally more concrete and hence they are treated before still pictures. In *the* discussion of visual aids throughout this book, there is a progression from the more concrete to the least concrete of the visual aids. i.e. from the school journey to graphic materials.

A. *The School Journey.*

By far the most effective visual aid available to classroom teachers is the school journey. By itself, the school journey is not really a visual aid, but a procedure by which objects and materials in their natural setting are made available to students for detailed study. Because it makes the real situation the learning situation, and because it takes the students to the functional reality, it is treated as a visual aid, although the things themselves, not the journey, are the real visual aids.

In many ways, the school journey is the most valuable of the visual aids because it deals with real things in real situations. There is nothing abstract about it. If pupils are studying foods, or dairying, or health, they can visit a nearby dairy in which they see the process of milking, the process of pasteurization, the process of bottling, the process of sanitation throughout the entire dairy, and the process by which milk is distributed throughout the community. The children see cows actually milked, they see the milk actually treated with heat to free it from harmful bacteria, they see it actually put in bottles which have been

thoroughly cleaned and made sanitary, and they see it actually distributed" from the dairy to Mary's own front porch. Furthermore, there is a dairy within walking distance *to* most schools. The process is there in the concrete awaiting inspection and study by teacher and pupils. Pasteurization then becomes much more than a long and difficult word in a book-it is something which people in the community do to milk obtained from cows from the nearby country, to prevent the people in the community from contracting typhoid fever as a result of drinking impure milk.

No expensive or elaborate mechanical equipment is necessary for the school journey. One has merely to take the child out into the real world in which they and their parents and their friends live, to study the things that are very inadequately and very remotely conveyed to them through words of the textbook or the words of group the teacher. But like any worthwhile activity, it must be carefully planned, it must be skillfully directed, and it must be made to correlate with the curriculum and to contribute to the unit the pupils are learning. School journeys must not be confused with picnics.

8. M*useum Material.* A group of valuable visual aids readily available to the alert teacher is classified under the general heading of museum material. This includes all sorts *of specimens,* such as animals, leaves, plants, stones, etc.; all sorts *of models,* such as miniature houses, villages, trains, automobiles, etc.; and all sorts of *objects,* such as Indian arrows, spears, cells, etc.

A far seeing and effective teacher was recently discharged by a school board for taking his pupils out on picnics; when they ought to have been in school learning their lessons. As a matter o f fact the teacher was teaching botany in a functional manner by taking students out in the fields to study plants as t*hey grew,* not as the process of growing was described in a textbook. This teacher, immediately after being discharged, was engaged on a scientific expedition the purpose of which was the study of Alaskan flora.

Museum material, like the school journey, deals with objects or models of objects in three spatial dimensions (length, breadth, and thickness) except that in the museum these materials are removed from their natural setting and displayed in cases. It is manifestly impossible for the teacher to take students to all places of educational interest, but it is not impossible to take materials from these places to the school where they can be displayed and studied by all the students. Relatively few pupils have the opportunity to visit a Roman house, the Roman forum, the Acropolis, or an Egyptian house and were they to visit them, they would find them in a sad state of disintegration. But a model of a Roman house, or of the Roman forum, or of the Acropolis at Athens, or of an Egyptian house can be displayed in the classroom (reduced in size, to be sure), restored to an original grandeur long since vanished from existing ruins.

Similarly, in only a few months of the year can birds be studied in their natural habitat, but a mounted specimen can be studied during any season if this specimen is available to the classroom teacher. Some aspects of reality-such as the flight or the song of the bird -- are lost in this museum procedure, but the full size; and form, and plumage of the bird are retained to pupil experience.

In other respects, the school museum is sometimes superior to the school journey in that habitats can be constructed to show life processes not ordinarily visible under natural conditions. If pupils study bees, they run the risk of a bad stinging if they disturb the hive. If they don't disturb the hive, the most interesting aspects of the life of the bee colony are lost. In the school museum the bees can be, and, in many schools are kept under glass so that the pupils can study at will the making of the honeycomb and other interesting phases of bee-life.

As in the case of the school journey, no costly equipment is necessary for the school museum. A school museum can be set up in any classroom; students willingly comb the community and far-off places for museum materials, and with some interest and ingenuity. Any teacher can assemble extremely valuable educational displays of real things or models available for study in the classroom.

Many progressive school systems are adopting the plan of establishing a central museum from which exhibits are lent to individual teachers at request any time during the school year. These museums supply live specimens, as well as objects and models *of* materials from all over the world. Literally, the world may be brought into the classroom. St. Louis has such an educational museum in its school system.

In other cities, municipal, state, or privately endowed museums are widely used for instructional purposes- The Philadelphia Commercial Museum, for instance, has a regular schedule of public school classes under instruction throughout the year. A well-trained staff directs the teaching within the museum. Unfortunately, however, there are many excellent museums throughout the country whose display cases are never soiled by grimy hands of curious pupils, not because pupils have suddenly acquired habits of cleanliness, but because school teachers and administrators are blind to the educational value of museum instruction.

Not many schools can afford life-size model groups with realistic backgrounds, but they can afford their own collections gathered by teachers and pupils, and they can avail themselves of the excellent museums already established throughout the country. This latter procedure incorporates the technique of the school journey since the museum material is studied in the museum.

c. *Motion Pictures.* Motion pictures are classified and discussed separately from other pictorial materials because they add motion experience to pictorial experience.

Of all the mechanical pictorial aids in education, the greatest progress in excellence of educational material and improved technical quality has been made in recent years in the motion picture. Within the past ten years talking motion pictures have been added to the educational market, and in both silent and sound pictures really remarkable material is being produced for school use.

The motion picture is particularly adapted to those subjects in the curriculum in which sound is an essential elements and in those objects in which dramatic continuity, motion, slow motion, animation, and microphotography are essential to the development of meanin8g. Values of the motion picture in instruction have been brought out in

A large number of experimental studies, but there is yet much research to be done before teachers develop the best techniques for their use. The introduction of talking pictures has raised many controversial issues between advocates of the sound and advocates of the silent motion pictures in teaching. Some attempt will be made in the chapter on motion picture to analyze the particular values if each of these types in the classroom.

Widespread adoption of the motion picture as an integral part of instruction, like widespread adoption of the less expensive visual aids, has been obstructed by the failure of educators to realize the full value of pictorial aids in education. Add to this obstruction the expense attached to motion picture equipment and

the general inertia among educators in adopting progressive methods, and it is easy to see why this powerful new tool of teaching is being used in less than 10 percent of the schools of the nation.

Unlike most of the other pictorial aids, the use of motion pictures in the classroom requires a darkened room and a special screen but the particular values of the motion picture more than justify this added equipment in the modern school.

D. *Still Pictorial .Materials.* Perhaps the most readily available of all visual aids are still pictures. Valuable illustrative material fills the advertising columns of magazines; authentic prints and photographs may be had from many commercial houses scattered throughout the country; modern textbooks are including more and better illustrations; the stereograph is rapidly regaining its former prominence in the elementary school; lantern slides can be projected on blank wall spaces or on screens without completely darkening rooms; and small pictures can be projected on a screen with modem opaque projectors equipped with cooling devices which eliminate the former danger of burning the print before the pupils had time to study it in detail.

Most realistic *of* all still pictorial material is the stereograph. It is most realistic in that it is the only mechanical pictorial aid which supplies three spatial dimensions. It is particularly adapted to instruction in the school subjects in which a high degree of three-dimensional concreteness in instruction is desired.

There was a time when the stereograph was widely used both in the home and in the school. Somehow, it became associated with things old-fashioned, and as a result the teacher abandoned one of the most effective teaching tools. Only recently have educators begun to realize that in their search for new devices they had overlooked a valuable aid already available--now gathering dust in school storerooms.

Less expensive, but also less realistic, is the photograph, the photographic print, and the textbook illustration. Recently textbook publishers have greatly increased the number of illustrations in textbooks in various subjects, but as yet little attention has been paid to standards for the se lection of this illustrative material.

Commercial concerns have begun to salvage the photogr.1phic prints used by theaters to advertise current motion picture offerings. These prints have been arranged according to subjects and are being sold to educators at a price in excess of their true commercial value.

Teachers have realized the value of prints and photographs for many years, and illustrative materials are frequently mounted or placed on the bulletin board. They have not realized, however, that these pictures like other visual aids are not in themselves instructional, that pupils do not always study them, that pupils do not always see the significant features of a picture, and that pictures should be selected for teaching purposes according to certain definite criteria. Interpretation is always the keynote. Not all prints are good instructional media, despite the appeal of pictures to younger children. They are, however, the most available of the pictorial aids to teaching, and their systematic use greatly enriches the learning process.

For the introduction of color and the projection of a single picture visible to large classes, the film strip and the lantern slide are admirably adapted and widely used. Projectors and slides are relatively

inexpensive. Many types of slides can easily be made by teachers and, pupils. The slide projector lends itself to any pictorial study in which motion is not essential and in which detailed study of various features is necessary for the attainment of educational objectives. It is also less expensive than other visual aids since map slides, music slides, etc., can be purchased at a nominal cost, whereas wall maps and sheet music are relatively expensive. Most slide projection can be equipped with microprojectors by which microscopic slides may be projected and greatly enlarged. These are gradually replacing expensive microscopic equipment in science laboratories in the secondary schools.

Another projector valuable for large classes and for enlarged projection is the opaque projector or reflectoscope. Any small-sized pictorial material can be projected on these machines. For good visibility, however, it is necessary to darken the room when this projector is used. Some commercial concerns now combine the slide projector, the opaque projector, and the micro-projector in one instrument, thus increasing the utility of a single machine to various teachers or a whole school.

Easily available pictorial aids include textbook illustrations, photographs and photographic prints, stereographs and slides. These will be discussion in detail in a later chapter.

E. *Graphic Materials. A large number of visual aids are classified as* graphic materials, cartoons, maps, charts, and graphs are included in this classification. These are the most abstract *of the* visual aids and, as such, require the most careful training of pupils in their use and meaning.

1. Maps, for instance, are representations in two dimension of vast areas of land and sea which resemble a map only in gross outline imperceptible to anyone except when in an airship at an altitude not vet attained by man. If he were high enough, an individual could see territory which would be similar in gross outline to a map of a small community. On the other hand, no one has ever seen Italy, or France, or the United States in gross outline. In a map the gross linear outline is abstracted from a large area of lakes, rivers, mountains, valleys, cities, villages, *etc.*, greatly reduced in size, and reproduced in black and white or color in two dimensions. It is no wonder that without careful guidance in map interpretation a little girl identified the state of Ohio as the pink section in the geography book.

2. Similarly, cartoons are abstractions. Abstract ideas, processes, and situations are represented in terms of drawings of familiar figures and situations. The sovereignty of the United States is represented by the figure of a lanky old gentleman with a rustic beard, sharp features, and dress of the 1825 period. The sovereignty of Great Britain is represented by the stubby rotund figure of. a well fed gentleman of the same period. The one is called "Uncle Sam" and the other" John Bull." Yet despite their concrete representation in terms of familiar figures, "Uncle Sam" and "John Bull" are symbols; and a symbol is a form of abstraction.

3. Maps, graphs, cartoons, and other graphic materials are introduced as concrete materials without recognition of the fact that in a line representing graduation of the concrete to the abstract they lie toward the abstract end of the line. The mere introduction of this material does not insure the development of adequate concepts. The meaning of a cartoon or a map is dependent on the degree to which the abstract representations are themselves understood. The use of this graphic material in school instruction presupposes, for the grade levels in which it is introduced, a level of mental development and of concrete

experience which has not been reached. Yet this graphic material has its place and values.

4-. *Other Visual Aids.* Other visual aids not discussed in this book are (1) demonstration and (2) dramatization. The first is an integral part of museum procedure, and the use of object material is discussed in Chapter III; the second is often a recreational activity. Both these techniques are now widely used in the motion picture science demonstration has recently assumed a large role in educational films and dramatization has now become an integral part of most films on English and history.

III. VISUAL AIDS AND THE PSYCHOLOGY OF LEARNING

A. *Introductory Remarks.* The values of visual instruction, the relative effectiveness of the various visual aids, and of the techniques of their classroom use *have* been too commonly discussed and investigated without regard for their relationships to other and more fundamental problems. They are discussed and studied, as it were, *in abstraction.* Such discussion of learning and such experimental evaluation of methods of instruction must necessarily be sterile and may become wholly misleading. The problems of visual instruction can be adequately appraised and validly investigated only when seen III proper perspective: both with respect to mental growth and learning on the one hand, and with respect to the objectives of education on the other.

For the correct orientation of visual education into the whole complex problem of learning it is necessary to examine the process of mental growth and to derive the. psychological principles which apply to the values and use of visual aids. To do this we must turn 10 some recent work in genetic psychology and to the various investigations in the use of visual aids.

B. *How Generalizations Develop.* Mental growth is in part the result of two apparently antithetical processes: *differentiation and integration.* Recent experimental investigation has established the fact that original behavior is highly integrated, that the organism responds to stimuli as a whole. For example, Lewin studied the response of infants to various food substances and found that the very young child's reaction was a total bodily response. If lemon juice was fed to the infant, the withdrawal was not merely a withdrawal of the tongue and head, but of the arms, legs, and torso. Similarly, if warm oatmeal was fed the infant, the response was a total bodily response toward the food, i.e., the head, arms, legs, and torso were directed toward the desired food. The infant reacted in unitary, undifferentiated gross bodily movements toward or 'way from the stimuli.

Lewin, Kurt. A dynamic theory of personality (New York, 1935), Chicago Ill.

Through, the course of experience, differentiation of response develops out of a total unitary response. This differentiation is not limited to gross bodily movements, but is observable throughout the entire range of child behavior. The child soon differentiates milk from water, the bottle from the breast, the mother from the nurse, the mother from the father and the other children from the parents, etc. Psychological objects are differentiated out of their environment as they attain significance to the child through his needs.

It is in this elementary process of differentiation, that visual aids have their value. Without concrete

experience with objects there is no differentiation *of this object out of the vast environment.* . It does not exist as such for the child. The little girl who saw a cow standing under a Christmas tree chewing gum had had little differentiated experience either with evergreen trees or with chewing movements not involved in actual eating. To the child Christmas trees and evergreen trees were synonymous because her only previous concrete experience with evergreens was in their relation to Christmas ceremonials. Similarly, her only previous experience with a chewing response other than eating was with gum. Hence. to the little girl the cow was actually chewing gum under a Christmas tree.

Upon the kindly explanation of the woman, the child's responses probably became differentiated. Evergreen trees came to exist in new relationships beyond their role in Christmas ceremonials through actual concrete experience with these trees. The child's responses to chewing were expanded beyond the limits of chewing gum through concrete experience in a- new and now differentiated situation. Her experience had become richer.

But differentiation is generally accompanied by a secondary process of integration. As experience with evergreen trees becomes differentiated into richer and richer patterns through experience with firs, pines, spruces, cedars, etc., the abstraction of "evergreen trees" develops through the emergence of a general pattern of trees having the common quality of a peculiar type of foliage which remains on the trees throughout the entire year. Through some common element or elements the various differentiated patterns of response become integrated into a higher order of reaction. Each concrete experience becomes integrated into subordinate relationship within the higher order response of "evergreen trees." Thus through the process of integration of differentiated concrete experiences that type of reaction is developed which is known as abstraction and generalization. *The abstraction or generalization attains a richness of meaning to the extent that concrete experience is wide and varied and to the further extent that this wide and varied concrete experience becomes integrated into a higher order of relationships.*

c. Vocabulary *Growth.* The process *of* integration and resultant abstraction is illustrated in the development of vocabulary in children. There is a progression in vocabulary content from words of concrete relationship to words *of* generic relationship. All language is symbolic and the use *of* symbols is essential to all abstract thinking. Yet language remains relatively meaningless unless it grows out of concrete experience.

The normal process of mental growth includes the development of ability to do abstract thinking. In the Stanford revision of the Binet Intelligence scale, children are required at the age of three to name objects in several pictures. At the age of seven they are required to describe the content of these same pictures, and at the age of twelve to interpret the picture. In these tests differentiation precedes abstraction.

In the process of differentiation the values of visual aids become apparent. They supply the concrete experience by which differentiation becomes possible. Furthermore, they supply the situation in which this elementary differentiation, which precedes the higher form of integration, becomes not only possible but also necessary. In this way, the more abstract reaction becomes meaningful through the preliminary and prerequisite psychological activity born of particularized experience.

To go back to the criticisms of school learning made by the survey committee in Boston in 1845 and reiterated by Caldwell and Courtis in 1924, we now see that learning was ineffective because the learning material was maintained on the abstract level without provision for concrete experience' which would make the abstract material meaningful. Brownell complained that children did not develop abstract number ideas because they had not been given sufficient concrete number experience. Brownell and Chazel found that, without the preliminary concrete experience requisite to the abstraction, drill on the abstract level was ineffective in teaching primary arithmetic. Deans found that, through the systematic provision of wide and varied concrete experience, abstract ideas and higher mental processes could be developed in children much more effectively than by any other method of arithmetic instruction.

There have now been set forth (1) psychological theory of the process of mental development through a wide and varied differentiation of concrete material, and (2) the integration of those differentiated responses *into* a higher type of response known as abstraction and generalization. They are confirmed by the evidence derived through experimental investigation of learning abstract skills in school situations.

D. *Progressive Development.* . Constant reference has been made to "progressive stages of development from the concrete to the abstract." Concrete and abstract must be considered as relative; they do not exist in the absolute. Some words may be abstract to one person and concrete to another. For instance, to the person who has never seen a chair or had any experience with a chair the word is abstract. To another, the word is concrete. Further, the word chairs denoting particular chairs in a room to be moved or to be sat upon is concrete, while the same word used in the sentence, "Chairs are pieces of furniture to be sat upon," is abstract. Similarly, the Chair of English in a university is more progressively abstract, denoting not a concrete object to be sat upon. but a position of distinction in the academic world. Another example is the word crown. It may indicate a piece of money, upon which is the imprint of a crown. On the other hand, it may indicate the actual crown itself, which is worn on the head by royalty. Or, it may be used in a sense symbolic of all the power and authority vested in the office held by a person who wears a crown. Concrete and abstract are not absolute terms: they are relative.

The stages *of* development from the concrete to the abstract are, consequently, relative, and as such involve a progression in serial order. Each stage of development. emerges from the previous one, and is dependent *for* meaning on the breadth and variety of experience on the previous levels of development. For the child to develop a meaningful abstract number concept of 3, a wide variety of previous concrete experience is necessary. First there is much experience with concrete objects, such as buttons, pencil, pieces of chalk, etc., etc., in a variety of situations. These objects may be counted, grouped, etc., in various arrangements. The number 3 still exists as concrete number. Next the child is given experience with concrete number on a more abstract level, i.e., with pictures, dots, and other representations. Here the difficulty of differentiating the concrete and the abstract becomes apparent. If a picture of three tomatoes were shown to the child who had never seen or heard of tomatoes, would the experience be concrete or abstract? If the child had seen, picked, handled, carried, and eaten tomatoes, the experience would be more concrete. Yet the picture is not the object itself, but a representation of the object, i.e., a sign of the object. It is a stage between concrete and abstract experience. Subjectively, it may be concrete, but objectively the pictures lacks many aspects of concreteness such as weight, spherieity, texture, etc.

The experience with pictures is still experience with concrete number, but things counted and grouped are not wholly concrete. They are what Brownell calls “semiconcrete.” After sufficient experience with the concrete and semi-concrete objects the abstract concept 3 gradually emerges. The number 3 expands in meaning so that it means 3 of anything – just 3. Formerly it meant 3 apples, or 3 dots etc. Or it meant 2 and 1 orange or apples or 1 and 2 oranges, etc. But through a richness and variety of experiences on the extreme concrete level, and later on the sign level, the symbol 3 comes to represent an abstract concept.

Levels of experience within the progression from the concrete to the abstract involve the concrete level in terms of the object itself, the sign level in terms of some representation of the object, and the symbol level in terms of the use of a conventualized representation of the object. Nowhere is this better demonstrated than in the development of the alphabet. The American Indians never progressed beyond the sign level of representations. They drew pictures of the thing to represent it. Rarely did a picture stand for more than the object itself. Occasionally, as in the picture of a turtle emerging from the water, the picture stood as a symbol-in this case, the symbol of safety. In the development of the Egyptian alphabet, the first stage was the picture._ Later, the use of papyrus and brushes, the pictures, became conventionalized, and lost many of their details. Finally, these conventionalized representations began to stand for sounds involved in the name of the object rather than the object itself. In this way, representation progressed from ideograms to phonograms. The letter now stands for a sound, and the combination of letters is the abstract representation of a thing, condition, *or* situation. Our letter M, for instance, is derived directly *from* the Egyptian hieroglyphic by which the picture of an owl represented the Egyptian owl, called mulak. Later the conventionalized picture came to represent only the first syllable, and there developed the Greek letter Mu. Finally the Romans used this symbol to represent the sound "mmmm" and the letter was carried into modem English through the historic Roman influence on England.

Yet to an individual any word involving symbolization is concrete or abstract in relation to the richness and variety of the previous con*crete* experience.

E. *The Aim of Instruction: Generalization. One objective of school instruction is the development of meaningful generalizations.* *T*his is done by furnishing the concrete experience to the development of abstract meaning. But as concrete and abstract are relative terms, it would appear that we shall make no progress in the improvement of instruction unless we recognize this relative ness and provide means of instruction which will supply concrete material at the level of development necessary for the formation of meaningful generalizations.

Where the concrete experience *in* terms of the actual objects themselves is lacking, differentiation comes about through experience with the concrete materials themselves. If, however, there has been some experience on this level, the use of material on a more abstract level is sufficient to supply the relative concrete experience. For instance, pictures, slides. etc. are valuable in history and geography as concrete learning material, yet pictures and slides are in themselves representative and consequently removed from the extreme of concreteness. Similarly. charts and maps are concrete in one respect, yet they are inherently abstract. Finally, words themselves are concrete insofar as the material they represent is in the content of experience. The extreme of abstraction comes in verbal generalization, which attains its full

content of meaning to the degree that the previous concrete experience on the various levels of progressive development has been rich and varied. For instance, the generalized statement, "The root of the present world unrest lies in the growing nationalism and imperialism in Europe and Asia," requires a wide basis of concrete experience, most of which, if it is to attain a richness of meaning to the reader, is acquired through the written or spoken word. The generalization is made meaningful by a rich experience in historical narration, a study of the tendency of nations to isolate themselves and to develop racial and geographic idealism and egoism, and of the tendency of nations to extend their rule over subjugated peoples throughout the course of the past hundred years, plus a study of occasions of manifestation of these tendencies today. Yet, for fully developed meaning, each of these elements is dependent on wide concrete experience of a more elementary nature.

Generalization is the highest form of integration. It is the development arising from meaningful relationship among a wide variety of experiences. Out of this integration of relationship emerges a higher mental process-one which is abstracted from the functional relationships of the subordinately related experiences. (Is this a meaningful generalization to you, or do you lack sufficient concrete experience to understand it?) It must be considered as an emergent and as such a higher order of mental process. The mere fact that concrete experience exists is no guarantee that generalizations will emerge. Concrete experience, whether with concrete objects or with language in more abstract form, may remain isolated and unrelated. For the emergence of a generalization. this concrete experience must be functionally related and this relationship must be apparent to the learner.

The emergence of generalization, as the emergence of any abstraction, is dependent, also, upon that quality of mind as flexibility. If the organization of the mind is flexible, abstraction and generalization will emerge with relative ease. Relationships between thins and things and situations will be readily built up. If, on the other, the organization of the mind is rigid in quality, insight into relationships will be difficult. Each thing and each situation will stand in isolation, apart from other experiences. It is this quality of flexibility which differentiates, in part, the "bright" from the "dull" person, the feeble-minded from the genius. The lower the order of flexibility, the less the development of relationships and the emergence of abstraction and generalization.

IV. GENERAL PRINCIPLES

If the truth of the theory thus far developed be granted, it is now possible to state four general principles with respect to the use of visual aids in the classroom. The neglect of these principles or the failure to grasp them in their real significance accounts for many unpedagogical uses of visual aids and explains why visual aids have yet to achieve their real value in the learning process.

A. *The value of visual aids is a function of their degree of reality.* In other words, visual aids are effective in instruction to the degree that they approach reality of experience. Conversely, the more they are removed from reality of experience, the more ineffective they are. Reality of experience is often considered only as *objective* reality, i.e., the real thing can be perceived by the individual. Rather, reality is subjective. The experience must be real to the child. A good illustration of subjective reality can be found in the motion picture. As the individual projects his experience into the situation and action of a motion picture on the screen, the situation is real to him. Objectively, however, the

situation is merely the projection on a white screen of a series of shadows accompanied by sound effects. In Edgar Dale's *How to Appreciate Motion Pictures,* a picture *of* a setting from "Shanghai Express" is reproduced. The Shanghai Express is shown in an American railroad yard against a background of freight and mail cars. Yet the *motion* picture camera caught only those dimensions of the real situations which were characteristic of China. On the screen the situation was not objectively real. It was artificially created in Hollywood. Subjectively, the illusion of reality was produced when the picture was projected on the screen.

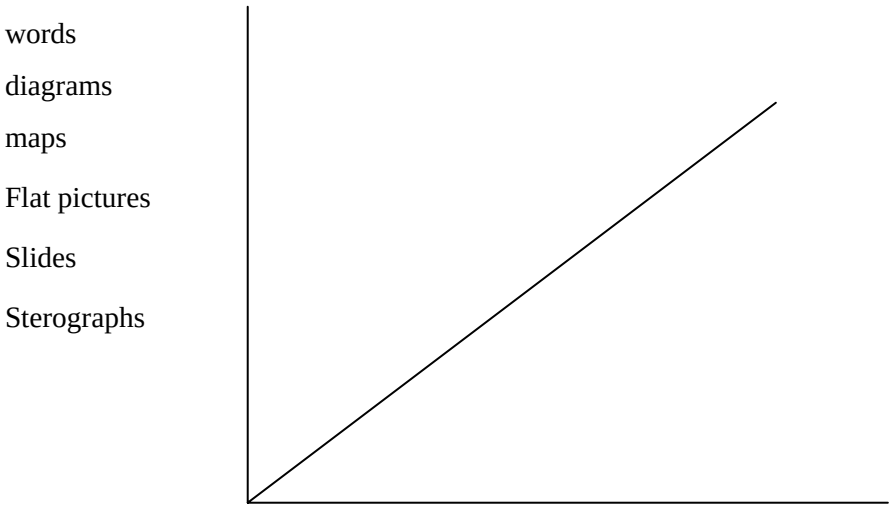
Dale, Edgar, *How to Appreciate Motion Picture* (New York, 1935). Opp. P 43

The visual aids used in the classroom must be made to seem real to the learner. *A.* motion picture which lacks this quality, i.e., which is apparently artificial or which furnishes the basis for wrong interpretation. lacks instructional value. Consitt reports just such an instance. In a film shown to school children in England, a Druid in long robes was pictured speaking from the top of an altar of so unusual a shape that a girl of eleven years confused it with a tiny hut. "I saw a straw hut that they built and there was a lady on top of it," reported the girl. At least twenty-five per cent of the children who saw this film of the Roman occupation of Britain thought "that the British women watched the battles from behind some kind of fencing, not from carts."

Consitt, Frances. The value of films in history teaching. (London, 1931), p. 197

Reality, then, depends upon how a thing seems to an individual. In the use of visual aids, care must be taken to see that the visual material is such that it has for the pupils an air of reality. Without this realism, the visual aid may not only fail to achieve its end of correct imagery, but it may further result in wrong information.

B. *The value of visual aids* is *a function of the nature and extent of the pupils' previous experience.* If varied experience has already developed wide and manifold differentiation and integration from the concrete through the intermediate levels of experience to the meaningful use of words (verbalization), further visual aids are unnecessary for the development of progressive abstraction. The relative effectiveness of the various visual aids is in direct ratio to the pupil's stage of learning and development. This. principle is illustrated in the following diagram:



Films

Models

Objects

Total situation

the concrete the abstract

In elementary differentiation o the concrete level of psychological experience, the actual objects in their natural setting ate of greatest value. The school journey is a technique devised for just this reason. It gives the leaner the actual experience I the total situation. However, school journeys are often impossible. In lieu of the journey, objects themselves cam be displayed. Museums are example of this technique. Sterographs are effective in that they display reproductions in three special dimensions. S on up the scale as each previous level has been developed out of the preceding level of experience, visual aids more and more removed from the objective reality may be used to advantage.

C. The value of visual aids is a function of the objectives of instruction in the particular classroom situation. It appears that the degree of reality and the previous experience of the learner are highly related and cannot be isolated from each other. IT must be further seen that the value of various visual aids is determined in part *by* the objectives of the instruction in the classroom. If, for instance, instruction is being given in the location of the various centers of economic activity in the United States, it is not necessary to take the pupil to Pittsburgh, Chicago, the cotton fields of Texas, or the *oil* fields of Pennsylvania. A map which shows these regions in relation to one another and in relation to the country as a whole would constitute an adequate visual aid for the learning of the desired *locations.* . If, on the other hand, the objective *of* instruction is to point *out* the necessity of the invention of the cotton gin, a small boll of cotton furnished for the purpose of extracting the seeds would be a better visual aid than would a film which showed the process of removing the seeds.

Furthermore, the extent to which verbal instruction should accompany. the use of visual aids depends upon the extent to which generalization is desirable, and the particular form of generalization sought. It is a frequent and grave mistake on the part of many teachers who make wide use of visual aids to consider that mere .visual experience without any language experience is adequate. Such thinking neglects the fundamental principle that all thinking is done in terms of language.

Mere concrete experience, in itself, is no guarantee of generalization; it merely supplies the situation by which this generalization becomes possible and meaningful. The actual generalization is and must be taught on the verbal level.

If teachers will first determine the objectives of instruction, they can then determine whether visual aids will contribute toward the attainment of this objective and which particular visual aid lends itself best toward this end.

D. The value of visual aids is a function of the intellectual maturity of the learner. It has been previously stated that flexibility of mind determines in part the ability to see relationships and to form generalizations. It is this same quality which must be recognized as determining in part the value of visual aids. The amount of concrete experience and it relative degrees of concreteness vary widely in use between the “bright” and “dull” pupil. The “bright” individual makes more and better differentiation in any given concrete experience. He sees relationships much more quickly. It follows, then, that the amount of concreteness of the visual aid is necessary to the development of any given level of abstraction is greater where the intellectual maturity of the learner is lower, and vice versa. The "dull" pupil must be furnished much wider concrete experience than must the "bright" pupil. Furthermore, relationships must be more carefully pointed out and generalizations more slowly formed and upon a much wider concrete basis. The advance from the concrete to the abstract varies in rate and quality with intellectual maturity. It is in this important aspect of development that school instruction has failed to provide for individual

differences. Provisions for individual differences are generally quantitative, whereas they must also be qualitative. Materials and methods of instruction must he provided in accordance with the psychological differences of the children.

BIBLIOGRAPHY

Brownell, William A., *Development of Children's Number Ideas in the Primary Grades,* Supplementary Educational Monographs, No. 35, Chicago: The University of Chicago Press, 1928.

Brownell. William A. and Chazal, Charlotte B., "The Effects of Premature Drill in Third Grade Arithmetic," *Journal of Educational Research,* 29. 17-23. November, 1935.

Caldwell, Otis W., and Courtis, Stuart, A, *Then and Now In Education,* 1845-1923, Yonkers-on-Hudson: World Book Company, 1923, pp. 53.4, 60.96, 85

Consitt, Frances, *The Value of Films in History Teaching,* London: G. Bell and Sons, Ltd., p. 197.

Deans. Edwina, *The Effect of Meaning: Method of Instruction in Teaching Second Grade Arithmetic,* Unpublished Master's thesis, Duke University, 1935.

Dorris, Anna Verona, *Visual Instruction in the Public Schools,* New York: Ginn and Company. 1928. 477 pp.

Dunn, Fannie W. (chairman), *Materials of Instruction,* The Eighth Yearbook of the Department of Supervisors and Directors of Instruction of the National Education Association, New York; Bureau of Publications, Teachers College, Columbia University, 1935, Chapter II.

Johnson, William H., *Fundamentals in Visual Instruction,* Chicago: The Educational Screen, Inc., 1927. 104 pp.

Judd., Charles H., Breslich, Ernest R., McCallister, J. M., Tyler, Ralph W., *Education* as *Cultivation of the Higher Mental Processes,* New York: The Macmillan Company, 1936. 206 pp

Koon, Cline M., and others, *Motion Pictures in Education in the United States,* Chicago: The University of Chicago Press, 1934. 106 pp.

Lewin, Kurt, *A Dynamic Theory of Personality, New* York: Henry Holt and Company, Inc., 1925, Chapter III.

Meuenger, J. Franklin. An Interpretative History of Education. New York: The Thomas Y. Crowell Company, 1931, pp. 213-4.

Progressive Education, XV, 2, February, 1938, entire number devoted to "Schools and Communities"

Yowell, Stella, "Are Children Reading?" *Journal of Educational Research,* 15: 14. January. 1927.