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HOW MAKE LABORATORY WORK IN PHYSIOGRAPHY CONCRETE.

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How make laboratory work concrete sounds indeed very like a paradox; for if laboratory work is not concrete, how can it be called laboratory work? It is true that the actual subject matter of physiography cannot be handled as can that of physics or botany, but I believe the work is concrete and that it can be made increasingly so. In planning laboratory work, we must avoid what has been called "busy work," and "the elucidation of the obvious." Real laboratory work will make the pupil feel that the facts learned are indeed his "by direct experience," which I understand is the meaning of the word concrete. I believe that physiography can be made to touch life as the ninth grade pupil knows it more closely than other subjects, but it must be made simple and as free as possible from technicalities.

The material used in the laboratory should be, as far as can be everyday appliances. Many illustrations should be drawn from the pupil's experience and the experience of his friends. The meaning of each exercise and its bearing on the general plan of the work should be brought out and emphasized, so that the pupil will not ask himself in bewilderment—Who cares?—What of it, anyway?—or think that the main object accomplished is the adding of one more page in his notebook to help him towards a credit. Laboratory work must be such as to strengthen the attitude of mind which makes a person hesitate to accept what he has not arrived at himself; what he can not verify for himself, and what does not appeal to him as reasonable.

We have one-half year for physiography in Chicago. I prefer to have no stated days for laboratory work, and to do such work, or textbook work, as occasion demands, spending sometimes five days a week, sometimes one day a week, on what may be called laboratory work. At present I begin with a study of the atmos-

phere and find that an exercise on the expansion due to heat is a most acceptable one for a beginning. It is easy for the pupil to make the matter of this exercise his by actual experience; for besides the ball and ring used in class, most pupils can give from life as they know it, examples of expansion of solids due to heat. Expansion in liquids leads us to the thermometer, the changing density of water, and the breaking of pipes by freezing water. Every pupil has enjoyed plugging tightly a cold bottle and throwing it into a fire, and he is pleased to recognize the result as due to the effect of heat on gases.

Exercises on the distribution of heat on the earth, and the influence of latitude and land and sea on temperature, necessitate the study of maps and isotherms. We can not actually journey far abroad and experience the temperature changes for ourselves. We can journey in imagination, and make the conditions noted our own by descriptions and pictures, and by comparison with the conditions with which we are familiar. Constructing a barometer with the class is not enough to make its use and application real. If this is followed by reading the barometer daily and discussing briefly the changes as they occur, the barometer becomes an actual thing.

The wind belts can be developed on a blackboard globe if the school possesses one of large size. Plotting the belts on a world map, while not giving a first hand acquaintance with the winds themselves, fixes them in the mind, and makes a definite impression such as mere textbook study can never do. The ninth grade pupil is a very young thing and the formal feelings still appeal to him strongly. He is inclined to regard the drawing of the lines of a diagram as the real exercise, instead of looking for the interpretation of the drawing. This has been to me a real difficulty, and unless definite time is given to emphasizing why we have done the work, and what the diagram means, the pupils are inclined to regard, the drawing of the lines as the desideratum.

As we study the weather map the members of the class compare recorded conditions with those we experienced ourselves the day before. (Our map reaches us at the end of the day when school is over.) The boys and girls often stop before and after school, and between classes, to call each other's attention to the record of conditions which impressed them and to what they think the weather will probably be for the next few days.

At the beginning of the study of the land, individual small globes seem almost a necessity; for parallels, meridians, latitude,

longitude are terms too often badly mixed. Indeed they are still confused after many exercises.

A brief and, what seems to me, most meagre study of a few of the common minerals and rocks, pleases the pupils and serves as an acceptable introduction to the study of weathering. The pupils realize that minerals are not equally resistant, and that rocks do not yield with the same rapidity to the forces which attack them. The pupils look about them with an increased intelligence and bring in all sorts of things from the lake shore, from excavations being made for buildings, from the quarry, from the most unexpected places. As we begin this work, I realize again the lack of appreciation on the part of the pupil, that what he is reading about and what he sees around him are the same things. He comes to us thinking, somehow, that the discussion in the book must of necessity apply to places remote. It takes a direct effort on the part of the teacher to get most pupils in the habit of connecting what they read with what they see. They read that mantle rock is "loose material such as sand, gravel, clay on the surface of the ground." The majority of a class of forty will say that glibly enough, and then all of them, boys and girls, will declare that they never saw any mantle rock. So with bed rock, until some one suggests that perhaps the rock in an old quarry a mile or so from the school, may be bed rock. Unless the teacher takes special pains to connect what is around them with what is being talked about, the pupils do not make the connection, and the work never becomes concrete.

I have difficulty with the question—what rivers join Lake Michigan at Chicago? The children are surprised and pleased to find that the river on the map is the same one they cross on the Ninety-second street bridge.

When we take up the study of rivers, it has proved profitable to do considerable place geography, locating repeatedly the rivers, cities, states we speak of, and learning the names of the states so that a fair proportion of the class can name the states on an outline map of U. S. The work on rivers, glaciers, mountains, shore lines is less abstract when the class has a reasonably correct notion of where the important features are located.

In the study of land forms, I think topographic maps are most helpful, not detailed study of one or two maps but rapid study of the main features of as many maps as possible, comparing one with another. More than one aid to the understanding of the meaning of a topographic map is useful. (1) As an introduction

to the contour maps an exercise with a sand island is helpful. Draw rapidly a line to show the outline of the sea shore, with successive lines to represent the shore lines as the water is imagined to rise. (2) A piece of apparatus purchased some time ago serves this purpose well. It is of wood and represents a hill. The hill is made in horizontal sections and the cracks between the sections represent contour lines. Another part of the apparatus shows these contour lines as continuous pieces of metal on upright wires, forming a skeleton of the hill. The uprights on which the metal contours rest, can be pushed through the base bringing the contours to one plain and forming a contour map of the hill. (3) We have a set of small plaster models of a portion of the La Salle street. When these are studied with the map they bring out its meaning admirably. (4) From time to time pupils have made pasteboard models of various maps studied, and these are an excellent help in seeing a map as sort of a bird's eye view of the region. It has seemed to me that these various devices have made it possible for a class to read the main features of a topographic map, with a fair amount of ease. I hope I have not been deceiving myself.

After maps can be read, they make an excellent basis for the study of river work, the effect of the glacial invasion, shore lines. For ninth grade pupils such study should be made calling the attention to the main, big features illustrated, and with as many maps for comparison as the resources of the school equipment will allow. It is unfortunate that a class cannot be supplied with copies of Professional Paper Number 60 of the U. S. Geological Survey—"The Interpretation of Topographic Maps," by Salisbury and Atwood.

In the study of stream action and shore lines, a sand table makes clear many points which are hard for pupils to understand who have lived in the shadow of the steel mills most of their lives. On the sand table they see the difference between the river valley and the channel; flood plains and river terraces are being made, and the widening of valleys by lateral cutting is rapidly taking place before them. I find it an advantage to be in a part of the city where in places paving is still a thing of the future, and where rainwash makes gullies and alluvial fans on the side of the street.

I have avoided mentioning field trips as the discussion of these is another part of the program. Laboratory work calls constantly for illustrations from near-by places, which is most

valuable even when supplied by only a few members of the class. Lantern slides illustrate and emphasize the points made. With a little encouragement the children will find pictures from Railroad advertisements and other papers and will bring them in as illustrations of forms and processes discussed.

In general, I make use of various forms of apparatus, of diagrams, of sand and pasteboard models, of pictures, of constant and repeated reference to what we are seeing about us. If the subject is not obscured by scientific jargon, pedantic and absurd, physiography, or as I prefer to call it, High School Geography, is indeed concrete and a delight to the average child. I wish that my pupils might go from my classes feeling that "whereas they were blind, now they see."

EYESTRAIN IN CHILDREN AFTER THE MEASLES, SCARLET FEVER AND ALLIED DISEASES.

Our excellent boards of health in many cities in the Union, have very wisely directed that children suffering from the diseases above mentioned should be segregated from the rest of their companions in school for a considerable length of time during the continuation of their affection as well as afterward for fear of infection or possible contagion. This is eminently proper, and should be persisted in carefully, and a rigid quarantine effected and properly maintained during the disease and so long afterward as is deemed necessary.

There is, however, an additional reason why after an apparent cure of the local or constitutional disease, the children so affected should be granted a considerable vacation, and that is the eyestrain which almost invariably accompanies these diseases, and continues with the sufferer for some time after apparent bodily recovery. If we permit children so affected to enter school at once, at the time when the physicians permit them to return as free from contagion, there is great probability that bad results will follow, so far as the eyes are concerned. For they are at this time weakened for use at near objects, and the sudden exertion demanded from them, as for instance, in writing in a book and then looking at a distant blackboard for notes, or in looking at a book and then at an example on the blackboard exerts the accommodation of the eyes to an unusual degree and leads to eyestrain from which recovery may not take place for months. Instances of this sort have also been recently observed after the mumps, in which the eyes could not be used for near work for seven weeks, the least exertion being followed with a flow of tears, smarting and burning of the eyes.

Instances of this sort of eyestrain, occurring daily in the practice of oculists, prove how intimately the eyes are connected with the body and the folly of regarding them as mere things by themselves, the sight of which needs only to be tested by inexperienced men. People have to be taught by constant repetition, that the eyes are a part of the body, and are constantly exhibiting symptoms, such as have above been mentioned, to prove their close relationship.—*Journal Am. Med. Assoc.*