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## Biological Field Trips as an Integral Part of Science Education

### I. FROM THE STANDPOINT OF A COLLEGE PROFESSOR

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I have been asked to write a short article on this topic, treating it from the standpoint of a college professor. I confess after nearly forty-five years of teaching in secondary school, college, and university that I would have preferred to have dealt with the topic from the naive point of view of the beginning secondary school student. Here indeed field work has its most definite outcomes. But if we teach life science at the more mature level, we must also remember the place of the out-of-doors, for all too often the biology laboratory has become a place for the examination of dead things. Too often the odor of formalin and alcohol has taken the place of the clean, pure smell of the out-of-doors and our courses in life science have degenerated into drawing lessons and inexperienced carving matches.

Someone has said the environment is

just as important as the living things in it. In some respects it is more important for the student because the environment molds and dictates what will be found there. For this reason, if for no other, ecological field trips have a very important place in any real course in life science.

In the opinion of the writer the sooner that young people are introduced to field trips the sooner the course becomes vital to the students. This means starting the course in the fall with an introductory trip. Getting first hand experience with *living* things is one of the most important things that a student can do. The laboratory soon becomes, as a result of early field trips, a definite adjunct to the out-of-doors, and student collections added to the vivarium and aquarium make the laboratory a place of real interest.

After many years of experience with field trips, the writer has come to believe certain things are very important. First and foremost, the leader should be acquainted with the field: several student assistants should be taken in advance to the area which is to be covered. If possible, this area should be near the laboratory. The writer remembers many years ago as a young student teacher paying a visit to Dr. Herbert E. Walter, then a teacher in a Chicago high school. On reaching the laboratory, he found the room empty, and when he asked one of Dr. Walter's colleagues where he might find the class, the reply was, "He is probably over there in that vacant lot across from the school." Sure enough, there Dr. Walter and his class were at work making a study of spiders, their webs and their habits. The writer went home impressed with the value of this sort of thing as an integral part of a course in biology.



Biology in the Field

A second matter to be arranged in advance is to have a mimeographed map of the region to be covered made to be put in the hands of every student making the trip. Detailed directions are not so necessary as some explanation as to what will be found in the different localities shown. In a well organized field trip student assistants who have previously become familiar with a given area are stationed at such areas and act as guides and helpers when the students

arrive at that particular point. In order to spread the group, it is sometimes well to have them rotate in small groups through the different areas. A few problem questions should be issued on mimeographed sheets, each one being tied up with a definite area. In this way the trip becomes a real laboratory exercise.

The last and most important part of the field trip which tends to make it an integral part of the course is the discussion, with examples of specimens found on the trip, held in the laboratory on the day following the trip. In this way the field and the laboratory become an integrated whole, and the student sees the significance of the field work.

The suggestions made above are equally applicable in secondary or at the college level. There is, however, an additional value at the college level which is worthy of consideration. Able students may be sent into the field to make a small, but definite contribution to the knowledge of some particular locality by means of an ecological survey. It is interesting to note that Paul Houdek, the able secretary and treasurer of the National Association of Biology Teachers, when a student at Knox College made such a survey under my direction, gave his results in a paper read before the Illinois Academy of Sciences, and had his results published in their Proceedings. This sort of thing has been done by not a few students at the college level, and the results to them have been of very great significance, first because they were placed on their own in the solution of a definite problem, and secondly, because of the satisfaction found through the publication of a small article bearing on that problem. By all means, let us make field work a definite part of our life science program.

## II. FROM THE VIEWPOINT OF SECONDARY SCHOOLS

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A field trip should extend classroom activities into first-hand, objective experiences in about the same degree that a baseball bat or a crowbar extends the potential leverage of the human arm.

If the field trip does not accomplish stimulating and vivifying results, then some phase of the activity was mismanaged or technique of the planning was overlooked. For there *is* a technique of a field trip. A good field trip should be carefully organized yet have sufficient flexibility to take immediate advantage of new opportunities suddenly appearing, without dislocating essentials and without disorderly lack of appreciation. It is doubtful if different teachers should be required to follow identical procedures.

Let us begin by asking ourselves just why we are taking the trip. It will not be a good field trip if done merely on order from the chairman or the principal, or to meet competition from other teachers. The reasons are obvious. But if, on the other hand, there is an inner urge partly because the teacher feels the dynamic quality of life surging through the subject of biology, and partly because she or he senses the unnaturalness and inadequacy of the walled-in classroom, then things are going to be different. Such a teacher realizes that the American goldfinch in undulating flight is vastly more important than its static picture on the Audubon chart in the classroom. He also realizes that a walking stick, so superbly adapted by form and color that perhaps only one out of thirty-six saw it, sets a problem in observation instead of just an academic evaluation of long legs and extreme

“slenderization” as seen in the school insect collection. Similarly, the competition of plant against plant wherever the soil is moist is something that cannot be transported to the classroom. It must be studied locally. Wild creatures in their own habitat are normally uninhibited, unless alarmed. The digger wasp will continue to dig her tunnel kicking the dirt out behind her as she backs out, even though watched by forty pairs of eyes, if quietly observed from a little distance.

Little will be gained from a field trip unless the pupils have a sense of freedom and release, so that they are keyed up to seek, and, let us hope, to find. However, if this spirit of freedom goes too far, pupils will regard the trip only as a lark, and some pupil may actually be injured by other boisterous individuals. As in the classroom, a regard for order is the first essential.

So that the pleasures of anticipation as well as realization may be shared by the pupils it is well to announce the trip considerably in advance. School authorities should be consulted and the consent of parents obtained. Thus the trip will be safeguarded from the start. Whether the trip is to a stream, fields, woods, the sea shore, or to an institution, the teacher-leader should make a personal trip there first, getting necessary permissions and noting the things that pupils can and should see, also considering what possibilities there may be for special observations not possible to program. The time is limited; what are the most important matters?

Mimeographed sheets of directions and suggestions can be of great assist-

ance in interpreting phases of the trip, can provide spaces for notes and the answering of questions raised on the guide sheet or by the instructor, and can also serve as a souvenir of the trip for insertion in the biology notebooks. It is quite surprising to see how stabilizing such a question sheet can be for pupils who otherwise might go galloping around looking for a place where they could "jump the fence."

By a little planning it is quite possible that experienced pupils who have already passed the course and have been on previous field trips can accompany the class and assist individual pupils. This benefits these older pupils as well as those they help.

What sort of equipment shall one take? This depends upon the type of trip, but if living specimens are to be brought back to the classroom or laboratory, then glass jars, vials, boxes and pails are indicated. Whatever equipment is brought, student monitors will be proud to be custodians of such properties. Cheap magazines with soft, pulp paper are excellent for spreading out flowers and leaves between the pages. The teacher will do well to have one or more hand lenses for such items as insect eggs, tiny creatures, parts of flowers and the like. Student assistants can be of great help here.

If any of the pupils are experienced in photography this will be a real opportunity to take snaps of the group at work. Photographic records of such activities are stimulating additions to the department records. (The General Biological Supply House invites teachers to submit photographs of field trips for a prize competition in *Turttox News*.) Interesting subjects such as a bird's nest with eggs or young, a coiled snake, a big toad, or a beautiful clump of flowers, will certainly be seen. Remem-

ber that most of the cheaper cameras can take a "close-up" only if a portrait attachment is provided and the picture taken at the exactly prescribed distance, easily measured from a string cut to that length.

One or two of the best of the photographs might be reproduced in the school paper together with a write-up of the high spots of the trip. If any of the pupils are sufficiently experienced in descriptive and narrative writing this will be an excellent opportunity for them to correlate English and biology in producing such an article. The zoology classes in the Evander Childs High School each makes one visit the second term to the Reptile House in the New York Zoological Park. Here, "behind the scenes," a harmless King snake is passed about, a girl rides on the back of the 300-year-old Galapagos Island tortoise, every one sees a snake swallow a dead mouse, and dozens of other things take place. The graphic account written by a pupil, which later appears in the *Evander News*, has always been one of the best of announcements of this elective course to the school at large.

The direct results of exercises in observation, perception, and appreciation developed by well-organized field trips should bring new encouragement and stimulation to most of the members of the biology class. There are some by-products, also, that are likely to accrue. Through strong interests aroused by field trips it is quite possible that certain students may come to like biology so well that they decide to follow some biological profession. Two of my better zoology pupils became so vitally interested in the American Museum of Natural History, visited frequently by the class, that they eventually became staff instructors there. Another boy, not in my immediate class, is also now at the

Museum. Another young man, through similar reasons, has become the assistant to the veterinary in the New York Zoological Park. Through field trips the human relations between teacher and pupils and between pupils themselves can become warm and significant. The extreme differences between teacher and pupils tend to disappear. Previously un-

explored ambitions, weaknesses, and appreciations come to the surface through talks by the teacher with various pupils en route. The new joy of discovering personalities, capacities, and mutual points of view, brings into the group a more natural atmosphere which the wise teacher will take pains to encourage in the classroom.

### III. FROM THE VIEWPOINT OF ELEMENTARY SCHOOLS

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No stage in the period of formal education is more conducive to implementing the motto of Agassiz, "Study nature, not books," than is the elementary level. Here the teacher has exclusive charge of her group of children from nine o'clock in the morning to three in the afternoon. She can easily exempt herself from the routine of daily schedule and enjoy relative freedom to do with her children what she will.

The elementary teacher who chooses to exercise these immunities and to walk with her children may for the first time catch a glimpse of the world as it presents itself to her young boys and girls. She will discover that much of the familiar subject matter she has learned to use and to cherish lies far beyond the horizon of their experience and readiness. The windmills and tulip beds and wooden shoes of Holland would be missing. The Eskimos, Indians and pirates would not be there. Our political and military heroes would lie far beyond the horizon and so would the pyramids and mummy chambers of Egypt. These are remote. They reside in books only. Their attainment is instruction rather than education.

The children reside in a real world that they may hear, see, touch, smell and

taste. The sky is above their heads. The earth, rocks and minerals are at their feet. They stand submerged in an ocean of atmosphere. There is a world of plants and animals all about them. They are engulfed in a flood of light, color and sound. An endless galaxy of forces and phenomena; fire, magnetism, electricity, the rainbow, thunder, lightning, clouds, and so forth, present themselves. This is the world of things, forces and phenomena of which the children are a part and with which they interact. We teachers call this Elementary Science and Nature Study, for the want of a more inclusive title.

The range of subject matter is as broad as the universe. The teacher and the class may be as free as the subject matter itself. It is not a required subject as a rule. It is seldom a formal part of a course of study and there is not a very definitely prescribed method of teaching it. It calls for experience teaching. It begins with simple observation in the immediate environment with which the children interact and it employs the materials at hand. Said Bailey, "It cannot be reduced to a mere system, it is too comprehensive. . . . It is not cut and dried. . . . It cannot become a part of a rigid formal system

and method. . . . Its very essence is spirit. . . . It must proceed on the personal enthusiasm of those who are least bound by the tradition of the classroom."

The spirit and enthusiasm of which Bailey speaks is of paramount importance. Without this the best conceived program would fail. This incident cited by Dr. Edward F. Bigelow, former Editor of the Department of Nature and Science in *St. Nicholas*, is pertinent. According to Dr. Bigelow, one superintendent of a large city system complained, "I don't know what is the trouble with elementary science and nature study in my schools. I introduced it two years ago. I had my teachers prepare a course of study and I assigned fifteen minutes a day regularly to it, but the children don't seem to be interested in it. I have my doubts whether it is worth while to assign even that small amount of time to it. I am puzzled." Later, in a conversation regarding other matters, the superintendent jokingly referred to a visit which some of his teachers had made to the Adirondacks. A club went up there to stay for four weeks. They came back home at the end of two, reporting that it was the duller place they had ever seen. The puzzle was solved. The flare, the spirit, the enthusiasm, the conviction of its worth were missing. The most carefully organized program would fail without these to furnish the leavening.

The informal opportunistic approach seems more in harmony with the spirit of this children's world. But even though nature will not fit herself to a planned outline of grade and time placement, it does not mean that the work shall be without aim. Informal work, when guided by a skilled and artful teacher, is not aimless. To insure purpose and direction, she must have a

framework into which all things fit. In this instance she must have a dynamic functional view of nature in which plants and animals are all actively engaged in adjusting to the problems of living. They are getting their food, building their homes, protecting themselves against their enemies, reproducing and caring for their young, and adapting to seasonal change, just as we humans are engaged in doing all these things. She must sense a kinship between us and the rest of the living world. Her view must embrace the ecological balance in which every creature has achieved a place and is now engaged in the basic activities essential to maintaining that place. She must sense a framework of common structure and common function and interdependencies of living things and non-living things. Such a framework will give direction to her thinking and purpose to her work when she meets the great galaxy of things with their infinite variations as she goes along with her children from day to day. The teacher should have in her some of the philosopher, and some of the scientist, but more of the naturalist. She must not forget that she herself was naturalist before she was either philosopher or scientist. The successful nature teacher will be actuated by the aim of the philosopher and scientist, namely, the quest of truth, but she will employ the spirit and method of the naturalist in the conduct of her classroom and field activities.

In preparation for field excursions the teacher should go out several times to the childrens once. She should be filled with the promise that resides in the trip in order to have enough enthusiasm to inspire her children and strike a responsive chord in them. The same areas should be visited repeatedly with

the children. The same subject matter may be observed and studied repeatedly on successive walks as the season advances. Each day will bring enough change to furnish daily challenge to the children once they have learned to anticipate and sense change. When the stage is reached that the children want to go back to the field to see what has happened to the caterpillar colony they observed the day before or the milkweed worms they watched in the act of feeding, or the milkweed flower upon which they have decided to maintain a daily vigilance to detect how it turns into the interesting pod of fluff they observed and experimented with last fall, and when the children, as they return to the classroom, choose to talk about it, read about it, write about it and draw pictures about it, the zenith of achievement has been attained. At this point the

field study has become an indispensable and integral part not only of the elementary science work but of the total program.

This teacher will pass on to the next grade teacher a group of children who have had association with the world of nature, which is the need of every child, and the most inspiring part of his education. They may continue with their new teacher to visit the same pond and stream and woodland; the same hillside, ledge and quarry, the same tree and the same winter scene, for as the experience grows, and the insights deepen, these familiar scenes can open up new vistas and contribute new meanings that are intellectually satisfying to the expanding outlook. Said Linnaeus, as he laid his hand on a bit of moss: "Here lies sufficient material for the study of a lifetime."

## Special Articles on Field Trips by Teachers in Service

### FIELD TRIPS

*What We Can Expect of Them.* No activity that I have been able to introduce into my classes has ever approached the "interest appeal" of field trips. Never have I been able to obtain such undivided attention of a large group as when they see for the first time such things as winged ants, larvae of aquatic insects, a solitary blue heron carefully picking its way through a marsh, a pair of copulating frogs, or the banding of some birds. These experiences and many others are the property of all biology teachers and their classes regardless of location. During the first

few weeks of the school year we make several excursions to collect, preserve, and store organic material for the coming year. This not only provides a definite goal for each trip, but it is more economical than purchasing the preserved forms. "It should be the business of every biology teacher to provide personally as much of the material needed for class as is at all possible."<sup>1</sup> Of even more importance—the student is given an idea of different environments and the subsequent change in plant and animal form. Not the least

<sup>1</sup> Miller and Blaydes, *Methods and Materials For Teaching Biological Sciences*, p. 90, McGraw-Hill Book Company.