

READING ROOM IN PUBLIC SCHOOLS.

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THESIS

NATURE STUDY IN PUBLIC SCHOOLS.

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Comparison of Nature Study with Geography and History.

- a. Things learned.
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- k. Do not present facts the child cannot see.
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"Nature is man's best teacher. She unfolds his treasures to his search, unseals his eyes, illumines his mind and purifies his heart.- An influence breathes from all the sights and sounds of her existence. She is wisdom's self." Street.

The value of Nature study in our public schools would be much more appreciated, if its higher aims and methods were better understood by teachers and parents. Could be but once convince the people that the study of Nature would assist pupils to a better understanding of other studies; that it develops acute observation; that it teaches the correct idea of form, order, beauty and harmony; that it tends more than any other study to give a practical knowledge of things; that certain scientific rules govern every investigation; and that the thing sought after is Truth, - the study of this delightful subject would soon takes its place with the subject now taught in our public schools.

With Froebel came the breaking up of the old methods of teaching and the opportunity of Nature study; for not only does the latter follow the kindergarten theoretically, but practically; in those countries where the kindergarten has reached its best development, there we find the study of Nature in the schools as chief factor in education. Rousseau was a man with excellent thoughts and brilliant ideas upon the subject of education as is shown by his scheme of study, but he lived too far above the people to make practical application of his genius. He no doubt saw the hollowness of the education of his time and tried in the *Emile* - written in 1762 - to point out these errors. Its aims were to teach facts and to help the mind to give birth to new ideas; to teach things not words; to teach in the language and not of the language, to be, not to seem, which is the only true education; for, "Unless there are real ideas in the mind, there is no true memory." Pestalozzi and Froebel were inspired by the book and were able to discard the impracticable parts and still make use of its principles. Though Pestalozzi taught in a truly natural way, he left us no rules or system; and so it is to Froebel that we are indebted for the real teaching from Nature. His "Gifts" are as truly what the name implies to-day as they were in 1826, when they first appeared. His bases of education were religion, nature, language and art.

In France and Germany Nature study is taught in the public schools and is given the same amount of time in the programme as arithmetic and geography. This shows the importance of its position in the minds of the French and German teachers; and it also shows how kindergarten in the primary grades develops into natural history in the grammar grades.

In England the establishing of natural history societies in connection with the schools, was first accomplished at York in 1834; this was followed by Marlborough in 1863; by Harrow in 1864; by Rugby in 1867; and by Wellington in 1868. These schools made field excursions and formed collections and museums. Scarcely anything has been done in the United States to make the study of Nature systematic and permanent. To be sure zoology and botany have been studied for some time, but there is no Nature study in the primary schools; the work being confined to the high schools and there a tendency exists toward a microscopic study of plants and animals with a disregard for the coarser anatomical and systematic work. This is especially true in the colleges and larger high schools; and so in many cases a fruitful side of Nature is left untouched which might have been, and should be used in the primary schools. Farther, educators in stead of noting this fact, are rushing into print through the pages of our scientific journals as to whether biology should consist of plant study or animal study.

An objection offered to the study of Nature in the public schools is that it leads to Darwinism, which to the popular mind is the "monkey story" and means infidelity. Now to study plants and animals is simply to know them better, to know only the truth of their structure and origin, and knowing them, to use them as objects with feelings and maybe intelligence. Is that infidelity? Is there anything in the honest facts obtained from the study of Nature that would lead to the overthrow of the principles of religion? I think not. To me, it has given a deeper, stronger reverence for that Infinite Power which permeates all things; a better understanding of the beauty and harmony of the laws governing the universe; even the tiny cell of protoplasm, existing free in Nature as a complete organism, receives the same watchful care as man.

A second objection is that such a study of Nature does not cause growth of mind, that it is rather a diversion and pastime and results in the accumulation of a few facts. What do we aim to do with the child in our public school? The thing to be done is to teach him to be a man, - a man in every sense which the term implies, - a man who loves truth for Truth's sake, who loves the things of Nature, who loves the eternal justice of every act, action or thought; one who can be pointed at as a citizen having the requisite qualities within him for the duties and responsibilities of citizenship. Such is the development that the State requires at our hands for all its children. Can we give it in the study of Nature? The faculty of the mind which first awakens in the child is that of perception and this is brought about by the exercise of the special senses, particularly that of sight.

The power of observation is one of the most useful faculties, and should be cultivated and encouraged from earliest childhood to mature manhood. No subject taught in our public schools can give the same amount of drill that can be had from the study of natural objects. The life element in plants and animals engages the attention of children and urges them to further inquiry. They are ever present, whether at work or at play, at home or abroad, on daily walks or holiday excursions; they are always greeting us in the same sweet language of Nature which speaks to us through our senses, if we will only listen with the mind's ear and see with the mind's eye. How fitting are the lines of Bryant's *Thanatopsis*:-

"To him who in the love of Nature holds

"Communion with her visible forms,

"She speaks a various language; for his gayer hours

"She has a voice of gladness, and a smile

"And eloquence of beauty, and she glides

"Into his darker musings with a mild

"And healing sympathy, that steals away

"Their sharpness, ere he is aware."

From observations percepts are formed, and when several of these are arranged in order they form concepts and these concepts may be so grouped as to produce ideas expressed in words; now come conclusions from the object studied which may be compared with conclusions from other objects studied. Here again, in this field of comparison, Nature study has no competitor among the other subjects taught in public schools. The variety in plant and animal life, the simple structure of some and the complex structure of others is an inexhaustible source of comparison for all grades. Classification of plants and animals would naturally follow from these comparisons; those having like corresponding parts would be sure to be placed in the same group, thus accomplishing the study, and furnishing the requisite amount of orderly growth.

The third objection is that of expense. Work in Nature does not necessarily require a laboratory where each pupil may study and dissect out the parts of a specimen. Such work may be done in the regular study room, the pupil using his desk for a dissecting table without serious results to other work. The necessary apparatus would be a cyanide bottle, a couple of needle points, and a pocket lens, and perhaps a box of soil for germinating seeds. About three-fourths of a dollar would equip a pupil with tools that are to be used for several years. The material for study may be had by keeping both eyes open while going to and from school; every locality has its plants and animals and specimens are on every hand. Leaves, branches, buds, roots, and flowers; bees, butterflies, bugs, beetles, worms, snails, and frogs cross our path; these may be collected, and preserved by drying or by placing in alcohol. The children may be taught to collect material for a following class and so, keeping the future in mind, plenty of material may be had almost free of cost.

Teachers not being prepared to give the work is considered an objection. Now, with a very little time and at a slight expense teachers may be prepared if they choose. Procure a few good books upon the subject, such as Miss Jane Newell's "Leaves, Buds and Branches" and "From Flower to Fruit"; Gray's "How Plants Grow" and "How Plants Behave"; French's "Butterflies of the Eastern United States"; Aggar's "Trees of the Northern United States"; Mrs. Dana's "How to Know the Wild Flowers"; Beal's "New Botany"; Morse's "First Book of Zoology"; Cook's "Birds of Michigan"; Binney's "Land and Fresh Water Shells"; Hyatt and Arme's "Insecta". These books could be used by the children and furnished by the school board. Teachers will also find that six or eight weeks of the summer vacation spent at some school or college will aid them in doing better work in all branches as well as in the study of Nature. The Agricultural College has a school of this kind open every year to the teachers of the state, in which there are special courses given in Botany, Zoology and Chemistry and it is the opinion of all who take these courses that the vacation is pleasanter as well as productive of much good. The expense is very slight, much less than at many of the resorts, where so many teachers go for their summer. Country school teachers, in particular, seldom allow themselves any of these privileges. Now, there is no good reason why they should not, and by showing a keener interest in educational matters, be able to do better work, and command better salaries. The county commissioner might give his teachers a six or eight weeks' normal course in which Nature study would be one of the principal features; This would be a sure way of introducing this subject into country schools, and nothing could be done by the commissioners to-day, that would be more fruitful. Superintendents or principals could also direct this work, or place in the hands of some teacher who could give some time to directing other teachers how to manage the work in their several grades. This is being done with good results.

It is objected that this study will meet no practical end. Pupils say, no doubt at the parents' instigation, that Nature study is of no use, meaning that money cannot be gained from it directly. Is that to be the watchword for the next generation? Are we to spend all our energies in trying to eke out a mere existence? If so, Life is surely not worth the living. The child might as well better not be born than to live for the simple eating of food and wearing of clothing. There must be a higher aim than the paltry dollar to keep us here and at work. Give the child such training that when it comes to die, whether in childhood or old age, that it can say that it has truly lived. But, considering the subject in a narrowly economic way, why are our potatoes not destroyed by the beetles, our cabbages and tomatoes by the larvae of the butterfly and moth, our berries by the insects and fungi?

Who is it that is laboring diligently to-day to discover remedies for the disease of the peach and the grape? It is the naturalist, who is not only earning dollars but saving millions of them yearly to the people by his experiments. Let us turn the tables, and ask why we study some other things. Let us ask, is there any great amount of practical application in geography and history? Is it of more value to us to know the names and locations of the cities of Brazil, the rivers of Africa, or the history of Chili than to be familiar with the flowers and birds of our own dooryards, ~~to~~ with their foods and habits? Had I been taught to see and feel the nature that surrounded my childhood instead of learning page after page of history or geography, which was rolled upon the surface of my mind in such a way that I could catch the free end and unroll it to satisfy my teacher, I could now look back upon my early school days with some degree of pleasure instead of regret. The printed page is a mine of wealth to the one who knows how to use it and a desert to him who does not.

The place for Nature study is in all schools, city or country, and should be taken up in the first grade and continued throughout the grammar school. Upon experiment it is found that pupils of the 10th grade take a greater interest in Nature study than pupils of the 12th grade and that the interest increases the younger the pupil. It may be that the 12th grade pupil, having neglected the work when his mind was more susceptible, has turned his attention to other things, and looks upon the simple study of Nature as beneath his dignity. I am convinced that the work in systematic work in botany and zoology now done in the high school would be better done in the grades below, which would leave the high school free for higher work.

A course in natural history covering the first eight years of school life should take a prominent place upon the programme independent of other subjects; for subjects referred to only occasionally are apt to be considered unimportant, and neglected. It readily mingles with other work, however, and is indispensable in reading and language as well as in drawing. A few suggestions upon the real work of teaching may be of use to teachers who have not given this subject serious thought:— let the pupil study the real object instead of the picture. Living specimens are more interesting to children than dead ones, and should be given them that they may study actions as well as the object itself. The object should be in the hands of each pupil that he may discover for himself and not be dependent upon another's observations and judgement. Cultivate not only the sense of sight but those of feeling, hearing, smelling and touch. Study the objects with regard to their food, habits, and habitat; also with reference to other specimens so that the child may make his own comparisons and classifications.

Do not introduce too many objects, for they might confuse the mind,- the work of the day would be sufficient for one day's lesson, and the few specimens would be sufficient for two or three weeks. If the lessons become tiresome to the children, a change of objects should be made so as not to produce a dislike, instead of an interest, in the subject. Be careful of the facts which you present to the child and be sure that he can see and understand what they are before you bring them up. Always use typical specimens and avoid freaks,- too many of our museum specimens are not types, but those some peculiarities and should be avoided; the object is to get a knowledge of the perfect plant or animal. Let the child express, in his own words, the results of his observations and aim to bring out a variety of correct expressions. Descriptions of the object should be insisted upon every time and they might be oral or written and with drawings. Let the attention come from the interest in the study and not from compulsion: if the child shows weariness excuse him from the class for the day, let him know that it is because of inattention; do not consider it as a punishment, but as a necessity.

Suppose a lesson to be given on the White Robin (Plate I). First,- call attention to the name and you are called,- this leads them to think of the birds, the season of the year, and the singleness of the name. Second, show the plant as a whole, and note its size, height, odor and habit. Third, note the roots, their appearance and how they branch. Fourth,- examine the stem, its position, texture and direction. Fifth,- examine the leaves as to their number, shape, size, color, outline, apex, base, and arrangement. Sixth, take the flower, note the sets of organs, their number, color, arrangement and use. Note the relative size of petals, sepals, and stamens and compare. This lesson may be given to almost any of the lower grades,- with beginners some of the rarer parts to see might be omitted, but with third or fourth grades everything mentioned should be studied.

Children of the first primary should learn the words used in talking about the parts of the plant or animal studied; and these words should be learned according to the age and understanding of the child or of that grade. Use common names for plants and animals, reserving the scientific names until later in the course. Write all new words on the board in order that the child may see the word it was used as well as what the word stands for, and so teach the meaning and use of words as well as the words themselves. The child may now frame sentences from these words, and they, in turn, may be written on the board to illustrate the representation of ideas. These sentences may be direct statements or questions and answers,- for bringing out the different ideas of the children; the last should always be accomplished.

Sentence making learned, the child is able to express the results of comparisons. I accordingly show in Plate 2 the corresponding posterior legs of the honey and humble bees, from which a lesson in comparison may be drawn for the fifth grade pupils. Call attention to the relative sizes of the legs, their markings, number of joints, hairs, and spine. Note the differences in form of the corresponding parts of the leg-coxae, trochanters etc. - and their relative lengths and breadths. Compare the hairs as to color and kind, and the depressions and projections. Mark the things which appear in either which are wanting in the other and at the close of the comparison, have the children state completely all their conclusions. From the results of these comparisons the skillful teacher can build up little stories or descriptions for the children to read, and the story may be written on the board with the other work; the children are then ready to see how books are made. Take a blank card and make a drawing of the thing studied at the top with the words used in describing it, and the sentences or description as in Plate 3. And the result is the page of a book, the whole thing constructed by the children themselves. It is the advantage of the card over the printed page that it teaches the child how books are made and their use, while the printed page is liable to be considered by the child as an end instead of a means; to read is not an end but a means to an end.

In the fifth and following grades, the blank cards may be given to the pupils themselves, and they may be required to make a page of a reading book under the teachers direction.

For pupils from the fifth grade up, excursions into the fields for material for study, creates an interest and stimulates thought upon the things of Nature. There they find the flowers in their homes, on the sunny hillside or the moist banks of the brook; the birds building their nests, collecting their food, singing their songs or feeding their young. Days of this kind are anticipated by pupils of the high school with the greatest of pleasure, and are long remembered. If the high school pupils find pleasure in this how much more shall the pupils of the grades; in the grades is the occasional boy of restless temperament, disliking books and teacher; cursing the one and annoying the other - but bring into the class a live butterfly or moth, a beetle or bird, and see how soon he is captured. The rogue knows and feels that life within him and he soon forgets himself in relating facts regarding the habits, food, and friends of the little object. Such are examples from my own experience and they have taught me a lesson.

We must have system if we expect to accomplish much in the study of Nature; many teachers are now trying to introduce this subject into their schools, but have no definite plan. Without a plan different teachers will repeat work over and over again and so destroy interest and reach no end; this work must not be aimless; objects studied must not be selected entirely with reference to the time in which they can best be obtained, but systematically. Accordingly, I wish to submit the following scheme of study for the first eight years of school work; this scheme has not yet been tried, but will be next year in some of the schools of Grand Rapids, Michigan. The year's work is divided into two semesters, and the A class represents the first half year's work and the B class the second half year's work.

COURSE OF STUDY OF NATURE.

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First Grade; A Class.

Study the external characteristics of insects:- insect as a whole, then in parts; as head, body, wings, legs, eyes, and antennae. Make drawings of everything studied.

B Class.

Study seeds:- pumpkin, melon, pea, bean, buckwheat and corn. Plant seeds in moist, warm soil or sawdust and watch the growth, study the plantlet in connection with the seed. Name the parts of the seedling; the root, stems, leaf etc. Choose a variety of seeds, having the same general characteristics. Make drawings of parts and compare.

Second Grade. A Class.

Study the divisions of the insect:- the head, thorax and abdomen; the appendages of the different parts, the joints of the legs, the cells and veins of the wings. Compare one insect with another, make drawings showing like and unlike parts.

B Class.

Review seedlings and study kinds of roots,- as fleshy, fibrous and so forth; stems- as creeping, twining and branching; buds and branches. Make drawings of the different types from natural objects. Compare these types.

Third Grade. A Class.

Continue the study of insects, comparing parts and their arrangement. Study methods of collecting and preserving specimens.

B Class.

Study leaves - their venation, kinds, base, margin, apex, color general outline and uses. Make drawings and sketch upon the board while describing.

Fourth Grade A Class.

Study crayfish and compare with insects; their habits, food, movements etc.

B Class.

Study flowers - inflorescence, parts of flower and arrangements of parts, the plan of flower, and color. Make drawings and compare.

Fifth Grade A Class.

Study worms in connection with the larvae of insects; the food of both and the transformation of the larvae. Compare; study uses of worms and insects.

B Class.

Study the plant as a whole - root, stem, leaf, bud, branch, flower, calyx, corolla, stamens and pistil; functions of each part. Begin to use books along with study of object. Make drawings and write descriptions from observations.

Sixth Grade. A Class.

Study backboneed animals as the fish, frog, snake, turtle, bird, cat, dog etc; and their foods, habits and uses. Study elements of human physiology and hygiene.

B Class.

Study plants by families, such as crowfoot, lily and rose families. Take up one family at a time and study them until the general characteristics are known, then take up another. Make comparisons. Learn to classify from the key.

Seventh Grade. A Class.

Classify animals of all kinds; do field work; make collections and preserve them for future work. Continue the study of human physiology and hygiene.

B Class.

Continue the study of plants; the methods of fertilization; experiment upon fertilization, movement and growth of plants.

Eighth Grade. A Class.

Continue the classification; do field work; and study elementary work in physiology.

B Class.

Study comparatively plants and animals, their relations to each other and their classification.



WAKE ROBIN. BIRTH ROOT.
Trillium erectum.

See

Head

Ring

leg

Tail

Horns

Fly

T

T

T

B

C

5

T

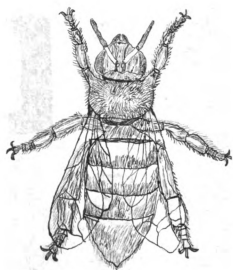
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sha

ber

see

Bee.
Head
Sting
Leg
Tail
Horns
Fly.



Looks
Lives
Hives
Food
Flower
Honey
Sharp.

The bee has six legs.
The bee has four wings.
The bee can fly to the flower.
Is the bee like the fly?
Can the bee sting?
The sting is sharp.
The bee lives in a hive.
The hive is a small house.

The bee looks like a fly. It has six legs four wings two horns, and a sharp tail. The tail is like an awl. The bee flies from flower to flower for food, bees live in hives and make honey for us to eat.

Plate III

Look
Line
Knee
Good
Power
Heavy
Sharp



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Bee
Wing
Leg
Tail
Body
Head
Thorax
Abdomen
Antenna

The bee has six legs
The bee has four wings
The bee can fly to the flower
As the bee takes the fly
Can the bee sting?
The sting is sharp.
The bee lives in a hive
The hive is a small house

The bee looks like a fly at first
six legs four wings two antennae and a
sharp tail. The tail is like an ant. The
bee flies from flower to flower for food.