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Syllabus of Lectures Nature Study

ANNA B. COMSTOCK

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WHAT NATURE-STUDY DOES FOR THE CHILD.

Develops powers of observation. Differences between the observation of the child and adult.

Observation should lead to logical thinking.

Nature-study gives practical and helpful knowledge.

Agriculture. Horticulture. Hygiene. Medicine. An understanding of natural laws.

Cultivation of the imagination by nature-study.

Cultivation of the perception and expression of the truth through nature-study.

Nature-study cultivates in the child a love of the beautiful; a perception and appreciation of color, form, and music.

Nature-study develops in the child a sensible altruism and humaneness.

Nature-study gives the child a sense of companionship with life out of doors. The value of this.

Nature-study provides interesting material for thought which may prove a help and an inspiration in other studies.

Nature-study is not meant for drill. The pedagogical value of a study that is not a part of the school drill.

As nature-study is done directly from nature it teaches the true value of books.

THE NATURE-STUDY BOGY

WHAT NATURE-STUDY DOES FOR THE TEACHER.

How the nature-study bogy was created; Lack of time; lack of training; exhausted nerves; lack of material; lack of appreciation of the value of comradeship between pupil and teacher; litters the schoolroom; not a part of the regular routine.

Lack of time.—nature-study not another study. A help in other studies. Use of recess. Busy work.

Lack of training.—How training may be gained. Sympathy in place of training.

Exhausted nerves.—Out-of-door interests the best of remedies. The annoyance of discipline obviated.

Lack of material.—It is a part of nature-study for the pupils to provide material. The testimony of teachers on this point.

The value of companionship between pupil and teacher.—The effect of discipline. The salutary effects upon pupil and teacher that comes from the latter learning to say, "I do not know."

A study not a part of the regular routine is a rest, a help in discipline, an aid and an inspiration to teacher and pupil.

Nature-study properly conducted is a great aid to discipline. The testimony of thousands of teachers on this point. The reasons: Sympathy; comradeship; new interests; absorbing occupation.

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PLANT STUDY

The Seed. The "lunch" for the seedling. The Cotyledons. Corn. Squash. Bean and Pea.

The Leaf. Its Use. Starch factory run by sunshine power.

The Stem. Its use. The petiole.

Experiments to show the relation of the plant to soil, water, and light.

The Flower. Its use. The use of sepals, petals. The parts of the pistil: seed box, style, and stigma and the use of each. The parts of the stamen: anther, filament, and their uses. Pollen and ovules.

Cross-pollination and its use in Nature-Study

The advantage of two parents in the struggle for existence. How plants meet this problem. Wind pollination. The advantage of insect pollen carriers.

The partnership of flowers and insects, the advantages to both parties.

Inducements for insects to visit flowers. Pollen and nectar.

Advertisements: color, fragrance.

Conveniences offered: alighting place and guide lines.

Devices to secure pollination by insects: Nectary is placed so that to reach it the insect must come in contact with pollen and stigma. Devices for avoiding self-pollination: the pink, composites, clover, etc. Devices to compel cross-pollination: the nasturtium, bluets, sage, orchids, pumpkins, willows, etc.

GEOGRAPHY AND PLANT LIFE

Geography and life, partners. Geography the mold into which life has been poured. Ecology.

Questions to ask concerning each plant: How does it get its food, water, and light? How does it overcome the difficulties of too much or too little water, too much or too little light? What are its devices for cross pollination? For distributing its seeds? For crowding out or living with other plants.

Pond weed—and sea weeds.

The water lily. A study of form as modified by environment.

The geographical radii.

A study of the adaptation of reeds; cat-tail flag.

Plants of the forest.

Flowers of the fields. Weeds. Daisies, buttercups, Queen Anne's lace.

The mullein. A study in adaptations.

Plants of the desert and their adaptations.

Plant life of high mountains. The flowers of mountain meadows.

NATURE-STUDY WITH TREES

Study of the parts of a tree and the uses of each.

Roots. Their two quite different uses to the tree.

The trunk or bole, its uses. Bark. Cambium. Sapwood. Heartwood.

The branches and twigs, their uses.

The leaf—its several uses. Use of leaf stems.

Blossoms and fruits.

How a tree grows. Wood grain. Sap. Resin. Transpiration. Storage of food.

How trees are affected by location; winds; enemies.

A GRADED COURSE IN TREE STUDY

Kindergarten and First Grade

Encourage bringing to school bright colored autumn leaves.

Classify them according to color.

Classify according to form.

Teach the names of the more common ones incidentally.

Draw leaves in outline.

Cut leaves in scissor work.

Second Grade

Mount leaves on cards in conventional patterns: four oak leaves, four maples, etc. Or outline leaves in patterns on a card.

Learn the names incidentally of those leaves mounted.

Outline by tracing many of the leaves brought in. Mix them and ask a child to select the maples, the white oaks, etc. from the pile.

Opening of horse chestnut buds.

Third Grade

Make a calendar for October with a leaf mounted and labeled for each school day of the month.

How to learn names of trees.

Observe a tree in the school yard for a year.

The pussywillow.

Fourth Grade

Study all the maples, oaks, poplars, pines in the locality.

A study of compound leaves.

Read about famous trees.

Make mounts of leaf and fruit, labeled.

Fifth Grade

A study of the tree as a whole.

How a tree grows.

The use of its parts.

Making leaf prints.

Sixth Grade

Tree Note books.

What should be observed and recorded.

The special study of an apple tree. Budding, grafting, insect and fungus diseases.

Where and how and why the tree should be sprayed.

The study of an apple as a fruit.

Seventh Grade

A portfolio of leaf prints of the trees of the region.

Correlation of trees with geography.

Correlation of trees with history.

A study of shade trees and why they are used.

The shelf fungi.

Eighth Grade

A study of the evergreens of the region.

Uses of wood of different kinds of trees.

The larger shrubs of the forests and parks.

First lessons in Forestry.

GEOGRAPHY AND ANIMAL LIFE

Animal life is dependent upon plant life.

The hare, the zebra or antelope—the plants on which the latter feed.

The lion, the tiger, the leopard, the wolf.

Animals must live where they can find their food, thus, since plant life is dependent upon geography animals must in this sense be dependent on geography.

Animals have become modified to fit their geographical environment:.

Aquatic animals and their adaptations: fish, tadpoles, the young of insects, mosquito, crayfish.

Animals living near or on the water: muskrat, beaver, otter.

Animals of the woods: racoons, bear, panther, wild cats, deer, fox, rabbits.

Animals of the trees: the tree mouse, squirrels, etc.

Animals of the open fields: hares, cattle, horses, woodchucks, gophers.

Animals of the high mountains: goats, sheep, chamois, mountain sheep.

Animals of the desert: lizards, snakes, camels.

Animals of the Arctic region: polar bear, fox.

The Birds and Geography: water birds, wading birds, birds of open fields, fence rows, forest.

Bird migration.

NATURE-STUDY WITH INSECTS

The life story of an insect. Eggs—where placed—caterpillars, grubs, nymphs, naiads. The part they play in the life history. The adult or winged forms. Uses of wings.

How insects breathe, eat, grow and molt.

How insects escape from or repel their enemies—: protective colors, warning colors, imitative form and color, stings, bite, offensive excretions, rapid flight.

Insect Homes—how insects meet the problem of winter. Cocoons, galls, miners, leaf-rollers.

Life history of Cecropia, Luna and humming bird moth.

Life history of woolly bear, black swallow tail, monarch.

Life story of the cricket and grasshopper.

Insects of the aquarium: dragon-flies, caddis worms, Mayflies, mosquito larvae.

Aphids, and aphid lion.

Life history of the potato beetle and ladybird.

The solitary wasps: the mud dauber and jug builder.

The leaf cutter bee—the little carpenter bee.

The social insects: Yellow jackets, ants, bumblebees and honeybees. The socialistic plan of their communities.

How to make an ant nest and an observation hive.

Economic Entomology and Nature-Study. Garden pests.

Social welfare: mosquitoes, flies, tent-caterpillars, bag worms, tussock moths.

NATURE-STUDY WITH SPIDERS

The chief characteristic of a spider is great skill as an engineer and very great patience. Spiders are not dangerous.

The difference between spiders and insects.

The life history of a spider.

How spider mothers care for their young.

Spider silk—what is it and how used: for travel by dropping and ballooning, for lining nests, for nests for eggs, to enwrap and move prey, as snares.

Cobwebs—funnel web—filmy dome.

The making of an orb-web.

Spiders that do not snare their prey: jumping spiders, crab spiders, trap-door spiders.

A GRADED COURSE IN BIRD STUDY

Kindergarten and First Grade

The birds. Adaptations. Begin with domestic fowls and make comparisons.

Feathers and their uses: Wing and tail feathers and how used in flight. Feathers as protection from cold and storm. Protective coloring. Ornament.

Beaks. Adapted in form to use in hen, duck, woodpecker, sparrow, hawk, heron, etc.

Eyes, ears and olfactory organs.

Feet and legs. Adaptations in hen, duck, woodpecker, heron, etc.

Songs of birds and language of domestic fowls.

Second Grade

Interest the pupils in birds. Burgess bird stories and other literature.

Correlate with these stories outlines colored with crayons.

Learn to know twenty birds. Observe them and talk about them.

Impromptu bird plays.

Third Grade

Let the interest be the feeding of birds in the winter.

The bird's Christmas tree. Feeding tables.

Color outlines and learn 15 birds.

Fourth Grade

Learn to know 30 common birds. Each pupil make a monthly calendar on which colored outlines of three or four birds to be seen that month are mounted.

Spring—keep in schoolroom a calendar of a robin's nesting habits.

Collect nests of known species and mount on cardboard with pictures of birds and short accounts of them.

Fifth Grade

Stress a wider knowledge of bird species and habits.
Drill pupils to observe birds.

Collecting of winter nests.

Stories of migrations of common birds correlated with English and Geography.

Bird Club with interesting programs. A spring calendar of returning migrants.

Sixth Grade

The emphasis of this year should be put upon field observation.

The bird field note-book. A bird census of a limited area.

A study of the following families: the fly-catchers, vireos, swallows, thrushes, woodpeckers, wrens.

Honors or prizes should be given to the one reporting the greatest number of returning birds in the spring. Rules for competition. An active bird club.

Seventh Grade

Stress should be given this year on the economic value of birds.

Making of bird houses and putting them up properly.

The making of feeding tables and bird fountains.

Exhibits of colored outlines and accounts of birds that benefit the garden, the forest trees, the shade trees, the orchards, the meadows and planted crops.

Debates on the good or damage done by crow, robin, cat-bird, English sparrow, chippy, etc.

Color outlines of 20 or 30 wood warblers.

Eighth Grade

The game birds and laws for their protection should be the theme for this year.

Color outlines of 30 game birds. Write accounts of the laws for their protection.

Bird Sanctuaries and their use.

THE CORRELATION OF DRAWING WITH NATURE-STUDY

Educational value of drawing. Relates the mind to the world. Graphic representations. Cultivate accurate observation. Form. Color.

Relation of drawing to art. What is art? Drawing in the schools is not art.

Drawing a natural method of expression. Should be kept a means of expression in school work. The drawings of savages. What and why the young child draws. How we have treated this instinct for self expression; how we should treat it. If a person cannot make a drawing of what he sees, why not?

Nature-Study as a help in drawing: In primary grades. In intermediate grades. In advanced grades. Uses of pencil, colored crayons, water colors.

The advantage to the teacher of a nature-study drawing; it shows what the pupil sees. Drawings should not be subjected to unfavorable comparisons. Free self expression a help. Drawing fixes form in the pupil's memory.

How drawing helps in the study of trees, flowers, birds, animals, insects.

Correlation of Nature-Study and Art.

The advantages gained by coloring outlines of birds, animals, flowers, etc.

NATURE-STUDY METHODS

HINTS FOR TEACHERS

Nature-study clubs.

The object lesson. Its use and misuse.

The teaching of anatomy in nature-study.

The use of stuffed specimens and museum collections in nature-study.

The use of illustrations. Blackboard work.

Use of lens or microscope in nature-study.

Dangers of teaching too many things. A smattering fatal to interest.

How to cultivate in the child the proper attitude toward death and the preservation of life.

The length of time to be devoted to the nature-study lesson.

The dangers and advantages of the correlation of nature-study with other studies.

SCHOOL-ROOM NATURE-STUDY

Window gardening. Egg-shell farms

Flowers. Fruits. Twigs. Leaves. Leaf prints.

Aquaria, how to make. Fish. Toads. Frogs. Salamanders. Turtles. Aquatic insects. Crayfish.

Breeding cages for insects, how made and used. Ant nests. Observation Hive. Terrarium. Canary. Mice, Rabbits. Guinea pigs.

OUTDOOR NATURE-STUDY

The field note-book. Voluntary observations. Outlines for field work. Illustrating note-book,—value to pupils and teacher. Pet note-books. Note-books should be the property of the child.

Collections of leaves, twigs, flowers, weeds, seeds, insects, stones, etc.

Study of trees and plants and birds in the school yard.

NATURE-STUDY WITH SOILS

Water as a solvent. Crystal growth. Blue vitrol, alum, salt, sugar, potassium bichromate, snow, frost.

Quartz, how to identify. Various quartz crystals, their appearance and uses.

Felspar, how to identify. Its two chief forms.

Mica, how to identify. Its many uses.

Granite, how composed. Its uses.

Clay, of what composed. Sand. Gravel.

Calcite. Marble. Limestone.

Experiments to show the action of water in clay, sand, loam and humus.

Proper treatment of clay soil. Acid soils.

NATURE-STUDY WITH METEOROLOGY

The wind, what it is, what causes it.

The winds of the world. Windmills.

The atmosphere, its height, pressure, and temperature.

Experiment to show air pressure. The thermometer. Construction and use of barometer.

Water, Condensation, experiment to show it. Evaporation: steam, water vapor, shown by experiment.

The condition necessary for forming clouds, fog, rain, dew, frost, ice, sleet, snow, and hail.

Storms, their cause; how they are forecast.

How to read the weather maps. Isotherms, isobars

The U. S. Weather Bureau, Weather Flags and signals.

School room weather records for primary and grammar grades and for junior science pupils.

NATURE-STUDY AND PHYSICAL GEOGRAPHY

Water.—Study of a brook from its source to its mouth.

Water seeks its own level; springs; gravity; why a brook flows.

How a brook looks and acts when it works and plays.

How and what it digs and carries. Where it finds its load.

Where and why it drops its load; what it drops first; last; how this builds up land.

What it does with stones. Pot holes. Gravel banks.

The current, its effect upon bends in the stream, steep hillsides; level areas; plowed lands; meadows and pasture lands.

Water as a sorter and carrier. Stream deltas.

The study of water in a dam, or pool. Compare to pond or lake.

How to map the brook showing its course from source to mouth or a section of it; also a small map showing the stream and the regions through which its waters flow to reach the sea.

Study the plants that are in the brook or on its banks, the trees near it, the animals living near it or in it. This includes fish, toads, frogs, insects, etc.

What birds abound near it? Show these on the map.

The Water Boys.

NATURE-STUDY WITH ASTRONOMY

In childhood we should be taught something of the wonders of the Universe.

The Sun—What it is—how it looks—its explosiveness—its corona—its size—its weight.

Sun Spots—their movements—the rotation of the sun.

The Sun's family—the plane of their rotation—what is a year?

The size and year length of Mercury—Venus—Earth—Mars—Jupiter—Saturn—Uranus—Neptune—The moons of the planets.

The relation of the sun to the earth: What the heat of the sun does for us. How the atmosphere tempers the heat.

Variation in time of rising and setting sun—why?

The longest and shortest day of the year—why?

The shadow stick and what it demonstrates:

The seasons, the equinox, solstice. What an eclipse is.

How to make a sun dial.

Uncle John's story.

Comets, meteors, or shooting stars.

The Moon—What it is. Shines by reflected light.

If the whole firmament were packed with full moons we should receive from them all less than one-eighth the sun's light.

What a moon is. The reasons for the difference in time of the rising and setting of the moon.

The reasons for the moon's phases.

The length of the moon; days and night.

The topography of the moon: High jagged mountains, 30,000 ft. high. The craters—33,000 discovered and mapped. Plains and chasms. The colors of the rocks. The force of gravity—one-sixth that of the earth.

The effect upon the moon of lack of atmosphere: no life, no water, no clouds, sky black, stars invisible always, shadows black, temperature of day and night, effect on rocks, no sound, no protection from meteorites.

The value of a study of the moon's condition in teaching physical geography.

The Stars—What a star is. How we have learned about the stars—telescope, mathematics, spectroscope and photography. Describe the stars, the distance from us to the stars measured by the unit,—a light year—about six trillions miles.

The nearest star—Newcomb's comparisons. The Pole star, the Pleiades.

Movement of the stars. Our star moves 800 miles per minute.

The life of stars—young, middle aged, old, dark.

How stars are made—Nebulae, The Milky Way or Galaxy.

What a constellation is. How the constellations were used by the ancients. Their names and legends, still used. How they mapped the sun's path by the constellations. The Zodiac.

The Polar Constellations: What they are. The Big Dipper, and the use of the pole star. The Little Dipper—The Queen's chair—The Dragon.

Why the constellations we see in the winter are different from those we see in the summer.

The Winter Constellations: Orion, Pleiades, Hyades, Twins.

The Winter Stars of 1st and 2d magnitude: Aldebaran, Betelgeuse, Rigel, The two dog stars, Sirius and Procyon, Capella, Twins.

The Summer Constellations: The Sickle or Lion, The Crown, The Lyre, The Northern Cross, Eagle, Dolphin.

Summer Stars of 1st and 2nd magnitude: Regulus, Arcturus, Vega, Deneb, Altair, Antares, Spica.

Morning and Evening Stars—Shine by reflected light—Venus, Mars, Jupiter, Saturn.

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