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STATE OF OHIO
DEPARTMENT OF PUBLIC INSTRUCTION
BULLETIN No. 1, 1915 **WHOLE NUMBER 5**

A COURSE OF STUDY IN AGRICULTURE

FOR THE
ELEMENTARY SCHOOLS OF OHIO

PREPARED BY DIRECTION OF THE
SUPERINTENDENT OF PUBLIC
INSTRUCTION

JANUARY, 1915

Monograph

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DEPARTMENT OF PUBLIC INSTRUCTION
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A UNIFORM COURSE OF STUDY IN AGRICULTURE

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PREPARED BY THE DIRECTION OF THE
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COLUMBUS, OHIO:
THE F. J. HEER PRINTING CO.
1915

Bound at the State Bindery,

To the Boards of Education, Superintendents and Teachers:

Agriculture is not a wholly new subject, nor is it one foreign to our public school system. The General Assembly made it a mandatory part of our courses of study for the Elementary and High Schools. The wisdom of this is patent to all.

This course of study is intended to suggest ways and means of giving to our boys and girls of all the schools the most helpful plans of acquiring a comprehensive knowledge of those parts of the subject that are appropriate and the study of which will be profitable; it is further intended to teach the happiness, health, and wealth of country life and to make the boys and girls proud of rural life whether they live in the country or not.

In laying out the work for the year, it should not be presumed that all found in this course is to be studied or taught; the material herein is suggestive throughout; select from it what is wholesome and in harmony with the agricultural and home life of your several communities; select only sufficient topics and amount of work as can be well done during the year; it might be well to outline the work month by month so that too much may not be attempted; four or five subjects properly planned for the year's work and well taught may be sufficient for the average school, for agriculture and home craft are to have only their appropriate share of the time and efforts of the teachers and pupils, — the other studies must have theirs.

The teaching of this subject will have reached the stage most helpful to the boys and girls when home and school work together heartily and sympathetically; the teaching must fail in its highest and best sphere if it does not touch and re-touch the farm, the farm home and all farm life; let it be our constant aim to make a happier and a better citizenship while we are making better farmers, and better home makers; this being our ideal, the teaching of this subject will find its best results and consummation in the homes and on the farm.

Yours very truly,

FRANK W. MILLER.

January 1, 1915.

INTRODUCTION.

It has been said that to know Nature and Man is the sum of earthly knowledge. But since man is the highest product of nature, there is really but one subject of study—the study of nature. Touch with Nature at first hand is the very breath of mental life. Children are born naturalists. In freshness, in lively interest, in originality, nothing equals a child. Its progress in learning is exceedingly rapid during its first years of life. This splendid growth process of infancy may be prolonged throughout life if the study of Nature has a central place in his schooling, if the love of Nature is implanted, and from it will spring the love of Art, of Science and of Religion. It has been well said that Nature Study is learning those things in Nature that are best worth knowing, to the end of doing those things that make life most worth living. Life is response to the order of Nature. Nature is all, over all, in all. Her laws are unchangeable. Nature is never against us. She is always for us. To have faith in Nature and learn of her is highest wisdom. Nature-study develops the power of observation and is the basis of all agricultural work. In the beginning we must fasten the children's affections on the region in which they are. We must teach them the common things with which they live from day to day. This is the new idea in Nature-study, that is coming gradually into our schools. In time gone by, the common school has had little relation to the life of its community; but it is undergoing evolution and gradually its point of view is being changed. The West has been putting Agriculture into its common schools, as has also the South in great part. It has been discovered that Agriculture may be made the means of training the minds of the young people as well as of giving them information. The study of Agriculture is fundamental, as much so as Geography, Literature or Physics. City schools teach city life and the facts and atmosphere that go with city life, yet many cities are adding Agriculture because of its broadening influence. If we are to have a healthy country life and a

normal country people we must organize schools to teach country life and the facts of country life. We must be able to get good men out of country life by founding and maintaining homes wherein good men of the future may find a place in which to be born. To live in harmony with one's natural surroundings has a moral influence upon character. The boy or girl who takes an interest in growing plants and animals cannot be so bad as the child who does not care for or love these things. There is nothing but goodness in most plants and animals, and the child who grows up in harmony with them must imbibe some of this quality. If the country school is to find its setting largely in the affairs, the interests and aspirations of rural life; if the school in the large city is to make the best use of the materials at hand, the teacher must give the course for this composite Nature-study-agriculture, which will enrich and vitalize other studies and the teacher who handles them as well. The teacher must be in sympathy with the work and also with the community in which he works. Sympathy is the ability to take another's point of view. It requires a clear head and a warm heart to get the point of view of the child and his environment, but it is necessary in order to lead, to encourage and to assist him to clearer mental vision.

THE TEACHER'S DUTY.

Every teacher ought to subscribe for several good farm papers and read them in order to get the modern viewpoint of the agriculturist. This will enable him to establish a sympathetic relationship with the community which is absolutely necessary before the best service can be rendered. Last, but not least, let every teacher in Ohio do some work in agriculture early this year. Remember, that all we eat, drink and wear comes from the soil. If you are teaching in the country, get your boys and girls to love their homes and to make them the most beautiful spots on earth. If you teach in a town or city, show your pupils that the only life worth living is the country life and to own a forty-acre farm is more to be desired than to become a drygoods clerk or a book-keeper for some coal dealer. Pupils so trained by an enthusiastic teacher will make a daily advance, not only in agriculture study "but in personal power, in general serviceableness, and in consequent delight."

Training in this subject comprehends all educational aims. It culminates in scholarship, culture and service, and brings happiness to all.

Nature-study must be taught concretely. Books and leaflets are helpful, but will not take the place of the object. There is no text-book of real Nature-study. Teachers, books, and leaflets should be guides to the animals, plants and minerals. The child must see and handle the thing himself if he is really to know it. Nature-study should put him into sympathy with common affairs and the questions of the work-a-day world and it should give him usable information. Sympathetic and vital contact with surroundings will create an ever-abiding interest in the mind of the child and help to neutralize the dead formalism of the school. It will open a way to a free, spirited and natural way of teaching and a less restrained and more wholesome outlook on life in the young generation. Nature-study will keep the teacher young and interested in life and enable him to teach with spirit and cheerfulness. What Longfellow said of Agassiz may be said just as well of the teachers and children who have the true spirit of Nature-study:

“And he wandered away and away
With Nature, the dear old nurse,
Who sang to him night and day
The rhymes of the universe.

“And whenever the way seemed long,
Or his heart began to fail,
She would sing a more wonderful song,
Or tell a more marvelous tale.”

PRIMARY DIVISION.

(Grade 1.)

FALL TERM.

The Nature studies of the First Grade will be largely informal, dealing generally with familiar material, increasing interest and cultivating habits of observation and description. There ought to be many excursions — if only around the school premises — sometimes on a voyage of discovery, but generally to obtain the necessary material or to satisfy some other definite plan. There ought to be a close connection between home and school, both material and treatment, serving to relate the school to the home. The beautiful in nature will be brought out as well as the useful. The moral side must not be neglected. Accurate observation, telling and doing, will lay deep foundations for a love of truth. Language lessons should be based chiefly on this work in order to stimulate the use of first-hand material, but not every piece of work should end in the inevitable essay.

Discussion of summer experiences and out-of-door activities.

The home and who live there. What does father do? Mother? Sisters? Brothers?

Rooms in the house; uses of each, furnishings.

Schoolhouse; rooms, equipment, uses.

Why rooms should be clean.

Public places; the church, store, depot, town-house, factory, bank, etc. What is done in each.

Make and illustrate a weather chart for each month, serving to teach days of week, name and character of months, seasons, birthdays, holidays, etc.

Informal field studies: Discover and follow seed dispersals in dandelion, thistle and milkweed. Identify a few common insects, a few most familiar birds, autumn wild flowers.

Plant bulbs of Chinese lily or paper-white narcissus in water.

Visit garden and farm to note autumn activities, harvesting, effect of frost. What the garden contributes; collection and simple study of common vegetables grown above ground; below ground. Draw and color a few. How stored for winter. Where we get vegetables when we have no garden; where the grocer obtains his supply; how he keeps them.

The pumpkin—in connection with Hallowe'en and Thanksgiving; the flower if available; the growth habit of the plant, Jack o' Lantern; preservation of seed.

Distinguish squashes from pumpkins.

Identification of individual trees near school or home, representing by drawing two different species selected from willow, cottonwood, elm, maple and oak. Autumn Arbor Day; transplant small seedling trees.

The first snow fall; observe descent of flakes, catch some upon cold dark cloth and study forms of large flakes.

Animal pets about the home. Animals at work for us. Where kept. How cared for.

Special study of the cat; habits, special senses, mental traits, wild relatives, enemy of birds.

The Christmas tree; purposes, source, decorations; evergreens as distinguished from trees which become bare in winter

Uses of coal, iron, gold, silver.

Mining, lumbering and farming.

WINTER TERM.

Illustrated weather chart for each month. Winter games and sports. How winter affects the home activities. The shortened day, noticing declining position of sun.

Clothing—Purposes, kinds, changes, care. Primitive clothing.

Identification of summer and winter materials. Sources of each.

Shelter—What plants and animals do in winter; why houses are necessary to people; primitive homes; building materials. Uses of doors, windows, screens, storm doors, porches.

Make doll house of pasteboard or box. Equip with furniture, rugs, utensils; preserve distinction of rooms.

Heating the home; kinds of fuel; source and supply of wood; coal and gas; carbon the heat former.

- Food — Name articles of food; where food comes from; carbon in food and how eating keeps the body warm; winter sources; home storage; habits in eating and drinking; source of water; methods of cooking; simple lessons of hygiene of nutrition; care of teeth; table manners; thorough mastication; value of good cheer and appetite.
- Care of house plants; plant necessities — soil, light, moisture, heat. Identification of a few common house plants; observation and care of bulb plants started in the fall.
- The caged canary; habits, care; studied at home; other seed-eating birds.
- Breathing and ventilation especially in sleeping rooms. Oxygen, the life-bearer, and how people and animals must breathe to get it. Simple lessons in proper habits.
- The five senses — Recognition, uses, practice and care of sense organs. Trace the senses among the animals; why absent from plants?
- Emergencies — What to do in case of cuts, scratches, burns, nose bleed, frost bites — lessons given as occasion affords opportunity.
- The horse — Uses, disposition, habits, care, fitness for service to man.
- Plant nasturtium in window boxes and in egg shells; later transplant from egg shells to school or home garden; advantages of early planting.
- Anticipations of spring; lengthening of days and other seasonal changes; weather, birds, trees — pussy willow, soft maples, elms, weeds, hibernating animals — insects, earthworms, snakes, ground squirrels; preparation for gardening and lawns. Window boxes. Winter games and sports.
- Gather a few pupae for study as they emerge in the spring.

SPRING TERM.

Continue weather charts.

Spring time activities at home; cleaning house; putting up screens and awnings; change in clothing; cleaning up the yard. Repairs; identification and use of a few carpenter's tools.

Follow changes in willow, soft maple, elm and study these twigs indoors. Opening of flower and twig bud; experiments in growing trees from cuttings in water, sand, loam.

Early growth of herbs; identification of three or four common weeds and of wild and cultivated plants by means of foliage and habit of growth.

Make home and field acquaintance with a few most familiar birds; seek details of characteristic habits rather than a long list of bird names.

Arbor and Bird Day; indebtedness to trees and birds. Plant seeds of elm, willow and maple or arrange to obtain them later if they are not now mature; plant cuttings of willow which were started in earlier study; plant a young apple tree, if one can be obtained; prepare and maintain a food table for birds; hang out threads, string or yarn as nest material; place a basin of water for birds where cats cannot annoy; add mud for robins' nesting; keep cat from harming birds. Have songs and recitation about birds and trees.

The squirrel and his habits.

Identification of a few spring flowers; simple wild flower chart with dates. Transplant specimens to wild flower garden at school and home.

The school garden. As a group, plant flower gardens and vegetable garden. Let each child have a share; develop choice of these plants for garden, planting pop-corn for next winter, and sunflowers for ornament or for food for chickens or other birds. Care of garden. Follow home garden, if a school garden is impossible. Plant nasturtiums as border against building, fences or walk.

If possible, study the frog and its development; collection and care of frog spawn or tadpoles.

Life history of moth or butterfly and observations upon specimens that develop from the pupae that have been gathered.

References: Holtz Nature Study—Scribners. Hodge's Nature Study and Life—Ginn & Co. Cumming's Nature Study—American Book Co. Schmucker's Nature Books—J. B. Lippincott & Co. Coulter & Patterson's Nature Study—Scribners.

FIRST DIVISION.

(Grades 2, 3 and 4.)

FALL TERM.

Make carefully planned observational tours to some place, field, garden, meadow, animal home (such as nest, burrow, barn, stable, sty, etc.), woods, flowing stream, spring, pond or lake, orchard, vineyard, factory, shop. Twice a week would not be too often. Let the children know the purpose of your tour before starting. Do not have more than one or two objects in view for one tour. On the following day talk about your tour and what was seen and learned. Collect specimens. Let the children write compositions on some object they have studied, its use, cultivation, etc., and keep for exhibits at school and at the fair. This may be made a part of the work in language. Some of the reading lessons *may be on subjects* pertaining to agriculture.

Aims of these lessons to the children:

1. Better and growing powers of observation.
2. Thoughtful habits.
3. Knowledge of a special kind.
4. Power of comparison acquired and the ability to distinguish objects — dissimilar and similar.
5. Storing useful information.

The oral and composition work may include description of objects, their uses, cultivation, etc., in language and terms understood by the child. All this may in many ways be used as a part of the recitation in other branches — as language, number work, oral geography, in fact the reading lesson some times may be upon subjects pertaining to Agriculture.

Trips with the following in view: Effects of the frost; sprouting of the wheat; corn well shocked; birds yet to be seen; quail haunts and protection of these birds; the apple orchards; apple picking; making cider; marketing the apples and cider (something of vinegar may also be learned); digging and mar-

keting potatoes and sweet potatoes; growing garden products; wild flowers; the forest trees getting ready for winter; make a collection of all kinds of seeds; caterpillars and other small animal life as time and the progress of the class will permit.

Plan the trip before starting; do what you intended to do on the trip; development of the pupils' powers to see and appreciate the things seen and to think must precede the development of the powers of expression. Oral expression in these grades should precede written work; elegant, forceful written work will lay foundations for thorough work in the science of Agriculture in all the grades.

What to observe:

I. Around the farm home: The flowers, the shrubs, the fruit and shade trees, the plants of the garden, the grains in the granaries and cribs, preparations for winter feeding, and housing, care of the farm animals, the pets of the children, the poultry; name the farm machinery and tools, and note the care of them; weeds, insects and birds.

II. On the farm: The plan of laying out the farm, names and number of fields, the woods, the fences, farm crops, harvesting of corn; the weeds and flowers; the trees in the woods, the trees along the roads and lanes, the shade trees and the fruit trees, the farm animals and their uses; the farm products, the selling and marketing of the same or their preservation.

Continue weather observations. Note the time of the first frost and the first snowfall. Is the first frost more severe in high or low places?

Gather all kinds of seeds and place them in properly labeled bottles for study and display. Get the children so familiar with them that they can distinguish them one from the other.

Seed distribution: cocklebur, Spanish needle and burdock stealing rides on animals and people. Hickory nuts, walnuts, acorns and beech nuts carried by squirrels. Squirrels gather beechnuts into piles, which are sometimes discovered by boys. Seeds like those of cherries and berries carried by birds. Seeds of tumblegrass blown by wind.

Preservation for winter and spring use of apples, potatoes, celery, cabbage, sweet potatoes and pumpkins.

Value of warm and sanitary stables for farm animals and poultry.

Observe the flocks of blackbirds in autumn and find out where they go. Study the migratory habits of birds. What birds remain with us all winter and what do they eat? Teach the children how to keep the birds with us all winter.

How to protect rose bushes, strawberries and rhubarb for winter.

Preparing for and sowing wheat; corn cutting; the shock; naming all parts of the stalk; the silo, the pumpkin crop. Uses of garden products and fruits; canning of fruits. The value and beauty of shade trees; beautiful color of leaves in autumn.

III. On the way to school and around the school house: Direct the pupils to make note on paper of the things they see and hear; set them a task by assigning one or two things to look for on each day to and from school, as,

Number and kinds of birds; work of some one in the fields or garden; domestic animals seen; specimens collected of flowers, seeds, fruits—wild and domestic.

General Suggestions.

1. The water in streams is muddy after a heavy rain because it is carrying soil and clay. Allow a tumbler full of muddy water to stand till mud settles. Pour off the clear water and allow the mud to dry. Examine. Streams wear their channels deeper and ravines are slowly formed. Teach this in connection with oral geography.

2. First lessons in sowing and planting are most impressive—the more so if the children do the work—all the work. Try it; have them plant at least one tree in October, let them do all the work, for they will be happy at it and happier in the spring when they see the leaves. Let them test some seed wheat in the seed tester.

3. Get some bulbs and have the pupils make a bed and plant them; you will all be delighted in the spring to see the bloom, and then you will have some material for spring study. Then do not forget that all this work at school is not yet what it should be if some of the same work is not done at the home of each and every child in these classes.

4. A trip to see some one thing of special importance — a tree for its foliage or fruit, its leaves, or signs of disease; to see a fine flower or garden bed; to look up the haunt or the nest of a wild animal or bird.

5. Young as these pupils may be it is the time to interest them in agricultural literature. Have the farm papers and nature study books at hand and assign short pieces to be read privately and reported to the class orally.

6. Have an exhibit of the work done at least every two weeks and invite the patrons in. Keep the best of these exhibits of every child's work for a general school exhibit of the township or village; keep the best of the township exhibits for the County and State Fair exhibits.

7. Let the teacher come to this task with a will to do as well or better in this subject as in any other. The next step will be to demonstrate to the pupils that the farm on which they live is their home and is just as full of life as their own flesh and blood; it is not essentially a dry and disinteresting expanse of lifeless dirt and stone; above all, it is not a less refined place to live than the city, or the village—these ideals must the successful teacher love and enjoy.

8. Organize a literary society or club; use the local clubs of women, or other persons to assist in interesting and helping these young people in what they do. Have some sewing, baking and cooking done by them; have them write or tell at school about observing the baking, cooking or canning done by mother or sister at home.

9. Place several subjects from this work upon the public programs that the school renders from time to time. Originality of the collections of specimens and in the expression should be good reasons for placing pupil on the program on these occasions.

10. In these grades the cultivation of the reading habit on these topics should begin and be followed patiently by the teacher. Have some books and papers adapted to these children always at hand.

11. In the study of the plant, teach the child to name all the parts, describe them, and give their uses. Care should be exercised so as not to require more than the ability and habits of the child can digest or fully comprehend. Collecting and

mounting specimens form a good foundation for this work. The study of any animal may be pursued on the same general plan.

WINTER TERM.

See suggestions for the Autumn term.

Retain many of the specimens of the autumn work for the fair exhibits and for the winter lessons.

The reading class, the oral geography and physiology classes are timely places for much work in this subject. Assign a topic now and then to be worked out in these classes. Read about some subject appropriate to the grades and the season.

Observation trips with the following in view:

The condition of the lawn and garden so as to endure the hardships of winter and to be ready for the spring planting; the orchards and fruit lots, the buds, the sap; do all trees shed their leaves at the same time?

Farm Animals:

The care and shelter of farm animals during the winter months; the bridle bit should be warmed on a cold morning before put into a horse's mouth; the feeding of such animals; the care of the stables, poultry houses and cellars. The farm shop and the tool shed, name of each tool and its uses, and care of these. The expectation of these observation visits will have a most salutary and uplifting effect on the farms and in the homes that you visit.

The Birds — Those that have migrated; those that will remain all winter; the feeding and housing of these birds and does it pay.

Have some research work done by pupils and shown by them in the public programs by the school as a part of the exercises.

The hibernation and habits of wild animals; description of the wild animals native to the school district and the mother care of these wild animals is interesting to the pupils and will be followed by them very happily if well directed by the teachers.

The frost and its effects — The frozen plant, frozen fruit, and frozen water, how protect from the frost, a strawberry

bed prepared for the winter, fruit and vegetables preserved in cellars.

Continue weather observations. Learn to locate and recognize the Great Dipper, the North Star, the Pleiades, Orion. Note the elevation of the sun at noon, and if there is a south window, how far the sunlight shines into the room; the time and place of the rising of the moon and sun and something about the phases of the moon.

Special study of the cat, of the dog and two or three other farm animals; their habits, senses, food uses, domestic and wild relatives.

Teach the reading and uses of the thermometer. Study how the house is heated, how ventilated; value of sunlight, uses of sunlight, power of the direct vertical rays over indirect or slanting rays; all kinds of fuel.

Study of different soils after the crops are harvested and where the ground is bare. Pick up stones that show effects of weathering. Stones decay. This decayed stone material mingled with vegetable matter forms soil. Compare with rust of iron.

Make collections of such seeds as are to be found; learn to name each when presented separately; let each pupil make a collection for the school and fair exhibits. Seeds of orchard fruits and garden vegetables may be arranged in exhibits and learned by sight by these pupils. Make a seed tester and get ready for the seed testing; let the children take an individual part in all this work.

The limbs and branches of the different kinds of trees—evergreens, forest and fruit trees—may be seen and studied at different times so as to note difference in structure and buds. Compare leaves of evergreen with those of the deciduous trees.

Ears of different varieties of corn may be brought to school and studied; size of grains and their quality, size of corn on good ears and on the improperly portioned ones, varieties of corn in the immediate neighborhood, popcorn and the popping of it; the study of stover, forage, meals and other feeds; the care of the corn cribs; the prevention of rat, mouse and other destruction of the grains; the shelling and grinding of corn.

Put some seeds to soak now and then and have the pupils

write and tell orally what they see. The value of the proper care of all seeds during the winter can now be well taught and thoroughly learned.

Visits to a market to see and learn the marketing, the names of new objects, the buying and selling, the care of fruits, vegetables, etc., and preparation of these to be bought and sold. The shipping of vegetables not native could be the basis of a fine lesson in agricultural geography.

Have experiments with the growing of cuttings, seeds, bulbs, etc., in boxes of loam or sand. Study these and have the observations written up and told by the pupils from time to time.

Study native wild animals, their habits, covering, home, hibernation, etc., have the pupils learn the native wild animals.

The poultry yard and house, care of laying hens, the gathering of eggs and the care of all these are fine topics for pupils of these grades. Construct buildings out of paper, showing nests and roosts. These make fine drawing and composition lessons.

General Suggestions.

1. The trips in the winter season should not be as long as at other seasons, they may be more specific so as to take less time if the weather is bad.

2. The work of the autumn should often be recalled and reviewed; specimens should be gathered and collections made that make a good exhibit. These should be preserved and shown at the school displays and at the fairs.

3. Effects of heat and cold should be well taught,—effects upon plants and animals.

4. Better farmers and farm life should be a constant aim in all this teaching. While we teach clean fields and gardens, we also teach clean bodies and minds in our pupils and the result will just as certainly be reflected in the citizenship of the future.

5. The habit of killing the wild animals and birds is now as never before a fruitful line for thought and should be counteracted by skillful teaching as fast as possible by creating different ideals and teaching the real uses of the different birds and animals; most of them are very useful.

6. The helpful sympathy and encouragement of the pa-

trons in this teaching is also to be an aim; that they too may learn is to be expected for they never had the opportunity to study these things in school. So teachers of boys and girls are also teachers of men and women both of the present and of the future.

7. The winter months are the ones to use especially for exhibits that the public should see, for it is at this time of the year that people like to be entertained; exhibits of garden products that are being kept over, of soils and soil testing, of grains, fruits, insects, seeds of all kinds and seed testing, plans for the farm and for the garden for the next year, drawings, paintings, articles sewed, embroidered, etc., all make fine displays and each has its lessons for the children and for those who see. Contests if conducted without friction are also good drawing cards for a school exhibit. Let the bulletins, books on Agriculture and Nature Study, and the courses of study be parts of the exhibit at all times.

The minerals of the neighborhood, the soils, etc., are splendid subjects for nature study work at this season of the year.

The physiology and hygiene of the farm animals can be well taught in this work in these and all other classes.

The materials for the County and State Fair exhibits can easily be taken from these displays and preserved until the time they are needed to be prepared for the fairs at the close of school.

SPRING TERM.

In addition to the aims set forth in the work of the Autumn, one more aim needs to be kept in view in the spring work in these classes, namely: The value of proper preparation for the planting in every detail — selecting soils, preparing soils, selecting seeds, tools in order, fences in order.

Investigate the results of previous work, such as looking into the hot beds and cold frames and the starting of such if not already done; the examination of the rhubarb and strawberry beds; the hyacinths, jonquils, crocuses, and tulips are very interesting study now when the children are so anxious to see something growing; the onion and lettuce beds should be well along, especially the former if there was any fall planting; transplant wild flowers and plant seeds. The fall work for the ex-

termination of weeds by destroying the old weed stalks and seeds by burning will now show its results and the attention of the pupils ought to be called to the value of this kind of work.

Around the farm house notice the condition of the flower beds, the garden and the fruit orchards; complete the preparation of these for the Spring planting and for the proper cultivation, fertilizing, spraying, etc. Learn the names of the different trees and plants found on the grounds; the walks and roads around the farm home and how to make them and keep them in order. Examination of the seed collections to see if they have kept well; planting seeds from these collections to see if they will grow. Note how the seeds have been preserved in different homes and call the attention of the children to the best methods of preserving grain, fruits and seeds of all kinds.

Get a measurement of each of the gardens represented in the class and use it in the arithmetic classes and for the purpose of planning what to plant in them. Study the plants and plans used the preceding year or years and teach the pupils how to improve upon them as to the beauty and utility of the gardens. Have the children draw plans for the flower and garden beds and for the whole lawn and garden at their homes; visit some of these that are well planned and point out the various useful and beautiful phases of each lawn and garden. Call attention to trees and other objects in the garden. Is it a good thing to have trees in the garden? Why, or why not?

Plant some flower and garden seeds in egg shells and in the seed tester; show some seeds growing on wet cotton or under wet cloth; transplant the young plants, teaching the children how to do the work so as to be successful, using great care to every detail and that the pupils grasp the idea of each step; have the pupils do the work and use all patience with them in their effort; if any fail, have them try again.

Visit some homes for the purpose of observing the house plants; it may have been well to have told the pupils that such visits as these would be made and then each home would have striven to have had something to show to the classmates when the observation visit was made.

Continue weather observations.

Study dew, rain and fog.

This work can be best studied by trips to the woods, streams, railroads and other places of interest.

Trips to the woods to watch the new buds open, to name the trees, to learn to know the trees by their foliage, bark and general outlines, also study the blossom.

Other trips to these woods to study the birds, their habits, their home-making, their food gathering and their real use to the garden and farm. The names of all the birds that remained over winter should have been well learned and then as the migratory birds come back in this season their names should be learned and the bird studied. Teach early in the school life of the child the useful birds and teach the special uses, and then we shall learn how few of the bird family there are that are not useful, for very many that we in the past have called enemies are in reality our friends and help very materially in the holding in check of the destructive insects; then back of the songs you and your pupils can hear on your excursions, think of the beauty of color and happy bird life you can see and feel.

The building of bird houses, the collection of material for the nests, and how the children can aid in this, the actual building of the nests, the eggs, the hatching and feeding the young, the rearing of the young and the flight from the nest. A most important element to be taught is the protection to be given these bird friends. With the forests thinning out more and more, the birds must be encouraged and assisted to make their homes with us.

The language work is alive when we use such topics as birds, bird life, and excursions among the birds as the basis of our language work; such material is here found and it is a live matter in one channel of book language work year after year.

A trip to the banks of a stream to observe the flow, the drift and sediment carried, the deposits along the banks, the effects of the currents and eddies, the flow of ditches, springs, smaller streams, etc., into it, all have a special meaning. If thoughtfully planned as a class affair and as a recitation these trips will dawn upon the pupils as lessons in drainage, on erosion, on fertilizing the land by deposits of the overflow of streams, on the value or harm of running streams, upon the health of the people by carrying away the refuse, garbage, etc., and, in addition to all these objects the subject of commerce over the running streams

may be elaborated upon and then lead the children from that to the study of commerce upon the canals, lakes and oceans.

A trip to the railroad depot or to the railroad to see the trains load and unload the express matter and freight, or simply to watch the trains pass and observe the products the trains carry to and from the neighborhood. Also study the other products carried to the farmers and observe the people traveling.

Many children and others, too, do not know the different plants—both wild and domestic—in their very young state; so a trip now and then to study the young flowers, weeds and vegetables, to know them by their earliest leaf productions will be worth while. Some of the seed collected in the autumn ought to be planted and the growth watched from day to day. By this method the pupils will recognize many of them.

The results of these trips can be worked out in the oral agricultural lessons and in the language work. The collection of interesting objects of study should be a very important part of every trip. Young as these pupils are they can be taught some of the diseases and the most harmful insects that visit the orchards and fields. The results of these trips to a language or geography class will rejuvenate the spirit of these classes even if the pupils do not understand all the technical parts of the subject.

NOTE TO TEACHERS.—The work under many of these suggested topics can well be carried on in the summer or vacation time, especially under the direction of the district superintendents and teachers who are employed for a longer time than the regular school year. It will be well to work out a system of home credits for the work of the pupils in all agricultural and household subjects.

SECOND DIVISION.

(Grades 5 and 6.)

FALL TERM.

Sources of Information.

In this division pupils should be taught the sources of valuable information for the student of agriculture. Important information can be secured from the following departments:

1. United States Department of Agriculture, Washington, D. C.
2. Ohio Agricultural Experiment Station, Wooster, Ohio.
3. State Board of Agriculture, Columbus, Ohio.
4. State Superintendent of Public Instruction, Columbus, Ohio.
5. The Agricultural College, O. S. U., Columbus, Ohio.

The Ohio Experiment Station, The Agricultural College, and the State Board of Agriculture and the Department of Public Instruction send instructors and lecturers where the public may require their assistance.

It is the duty of the teacher to encourage co-operation between the community and these departments that are prepared to give assistance in agricultural instruction.

To know how and where to get information is part of an education. The teacher can show that agriculture is one of the broadest fields for the development of the intellectual powers; that it is the study of the three great kingdoms of nature; the mineral kingdom, the vegetable kingdom and the animal kingdom.

Write for Bulletin 19, Division of Publications, U. S. Department of Agriculture; this is a classification of all the publications of this department for the use of teachers.

There is much illustrative material that can be obtained free of cost by those who will take the pains to write for it; teachers can secure from manufacturers many samples of

manufactured products, to show what can be made from the raw material of the farm.

Send to the U. S. Department of Agriculture for legume cultures for experimental purposes; food product maps; metric system charts; chart of the classification of clouds; a territorial map; and other similar publications from the government.

The Community.

This work should begin with a study of community life. The child should know the people of his community, and how they live; how the community supports itself, and its relation to the neighboring communities; how churches, schools, roads, telephones, telegraphs, mail routes and many other modern conveniences came to be here; pupils should be taken on trips to visit shops, mines, and factories where they can have an opportunity to see different classes of the leading trades of the country; let them see the working of levers, pulleys, derricks, cranes and steam shovels; examples of water power, steam, electricity and gas. Let them see the traffic of the city and the different occupations represented; transportation, commerce and manufacturing; methods of transportation on lakes, rivers and canals; on railroads and public highways.

Study the subject of soils; how they were formed; the lay of the land and how it is drained; what the farms produce and why; road building methods; tools and materials used in construction; costs and benefits to be derived. Teach the important facts pertaining to the community.

Let the children go on excursions from the city to the country; let them come in touch with rural life; let them see some model farms with their well-kept and well-arranged buildings; the barns filled with grain, feed and well-kept stock.

These trips may be used to furnish material for composition and language work.

Plants:

Continue garden work started in spring; care of strawberry beds and plants, raspberries and other plants in winter; tree planting in the fall; study contrast between evergreen and deciduous trees; plant nuts, peach seeds, acorns, and other seeds that come up the following spring.

Study the coloration and fall of autumn leaves; study changes as they take place in the oak, maple and a few other trees; make collections of leaves, of the walnut, elm, oak, willow, basswood, apple, thistle, clover, timothy, and other familiar leaves; arrange collections artistically on cardboard, in herbariums, or in some manner suitable for displays at township, county or state exhibits; leaves can be assembled in groups from their resemblance in venation, in base, in apex, in margin. Learn to recognize the leaves of each kind of tree represented in your collection.

Make a collection of different varieties of wood found in your part of the state; cut into sections or blocks of uniform size and length; show effects on the grained surface by cutting blocks lengthwise and at different angles; quartersawed; effects of planed and polished surfaces; modes of finishing woods.

Learn to recognize and name the different kinds of wood from the characteristics of the bark; the sawed surfaces; the rough and the polished sides.

Study the formation of grain; the texture and arrangement of cells; the rings of annual growth.

Study commercial uses and values of each; make a list of different kinds of woods and explain how used in construction of dwellings.

Study the woodman's life, forest and game preserves; conservation of our forests; natural resources; coal; waterpowers; water rights; iron; lead; copper; mines.

Make a drawing of a corn plant which has been carefully taken up by the roots. Cut across a piece of stalk; cut it lengthwise and examine structure; examine threads, air ducts, and outer part of stalk; note arrangement of leaves; circulation of sap; observe position of roots; study effects of cultivation, examine tassel; stamens; pollen; pistils.

Remove husks carefully from ear of corn; examine silk; fertilization; make collection of different types; study history; statistics; make collection of ten good ears; study uniformity; shape; weight; study kernel; draw diagram; structure composition; locate color, starch, gluten, hull, germ, tip and crown; observe number of rows, sides of kernel, embryo; study feeding value, and commercial value; manufactured products.

Make a collection of apples from your neighborhood; study

color, flavor, texture; market value, adaptibility, keeping quality; cut crosswise and lengthwise and make drawings, observe star shaped arrangement of seeds; name parts; name parts of flower and show what part remains on an apple; study other fruits in same manner; preservation, preserves, uses, manufactured products.

Animals:

Make a list of the animals of the farm, forest, stream in your neighborhood; this will include mammals, birds, reptiles, fishes, frogs, insects and other animal forms; explain difference in life; study beneficial and injurious forms; when possible make collections; make list of most useful and most injurious animals; make a comparison of the respective values of horses, cows, hogs, sheep, cattle and poultry; make a list of the manufacturing industries dependent upon these products of the farm.

Make a comparative study of the acorn and the egg; of the life of a tree and a bird; of the life of a frog and a fish; of a bee and a butterfly. Identify fish of the neighboring streams; those on the market. Study methods of catching; fish culture; learn the classification of a few such animals as the snail; tortoise; clam; eel.

Study migration of birds. Study care and protection of birds that stay with us over winter. Study birds as seed and worm destroyers, classify the birds of prey; songsters; waders; climbers; game birds; domesticated fowls.

The Ohio Experiment Station has prepared a bulletin on Ohio birds. It has been prepared expressly for the use of Ohio teachers, and will be mailed to you, if you will send your address to the station at Wooster, Ohio.

Write to the National Association of Audubon Societies, 141 Broadway, New York City, and ask for samples of leaflets, and directions for organizing a Junior Audubon Class for bird study. Send for Special Leaflet No. 22.

Have a lesson on the grasshopper. Make a collection of grasshoppers; name different parts of organs; legs, head, tail, wings, feelers; note the number and arrangement of the legs; observe shape and difference in size; shanks of hind legs; examine the antennae. Where is the grasshopper's backbone? Observe difference between vertebrates and invertebrates,

Make a similar study of the honey-bee; the cricket; house-fly and other insects. Study manner in which insects produce sounds.

Drawing. Study colors and drawing.

Without drawing and coloring, our study of flowers, birds, and insects will fall very far short of serving its highest purpose; observation, imagination, and creative power must go together. The Audubon Leaflets with outlines for suggestions and colorings can be of great assistance.

Minerals and Soils:

Make collections; pebbles, rocks, minerals, fossils; arrow heads and other relics of America's early inhabitants. Observe evidence of glacial period; evidences of lake beds; study bottom lands and source of alluvial deposits; difference between soil on high and low grounds; identify rocks and soils; study origin of gravel, sand, silt, clay, loam, muck, effects of atmospheric agents and elements on wearing away of hill sides; courses of streams; disintegration of rocks.

Farm Lands:

Let pupils use sand to show topography of immediate locality; draw map of a well-drained farm and illustrate elevations, depressions with relief worked out in sand; show water courses; arrangement of fields. Show location of buildings, orchards, wells, woodlands, pasture lands, crops and other important features of farm management.

Study preparation of lawns; arrangement of trees, shrubs, vines, flower beds; seeding, rolling, watering, fertilizing, weeding, study plans for beautifying home grounds and dwellings; study advantages of order, arrangement, system, cleanliness and sanitary conditions in all the buildings and their equipments and environments.

WINTER TERM.

The teacher can give instruction in agriculture by correlating it with every branch taught in the elementary schools.

Composition and Language:

Obtain colored pictures of famous paintings; there should be pictures of animals, rural scenes, and landscapes hanging on

the walls of the school room. The pupils should be required to talk and write of their trips to the rivers, woods, fields, barns, factories and cities.

Reading:

Select lessons in reading adapted to the season and to the subject to be studied; read from books on nature; text books on agriculture. When studying birds read from the best selections on birds by the best prose and poetical writers; (see list of selections and books). Make reading the exponent and vehicle of good things.

History:

Study causes for the agricultural and industrial development of the U. S. Study the progress made in labor saving machinery and its influence on different parts of the country; study the history of corn and other products; learn something of the life of Luther Burbank, Thomas A. Edison, and other men of science.

Physiology and Hygiene:

Make a comparative study of the structure of the physical organism of man and some of the lower animals; send for the "Farm, Stock and Family Chart", by the Orange Judd Company, New York. Send to The U. S. Dept. of Agriculture and get the Food Products Maps; these will facilitate the teaching of composition of food materials; study hygienic laws in construction of farm buildings; care of animals; study sanitation with reference to water supply.

Geography:

Study the map and learn the location of the region producing each of our leading agricultural products; study the states that lead in the production of each; explain causes for difference in products; construct relief maps and product maps; arrange a corn map, a map showing location of other staple products and also an animal map; send to Washington to the department of agriculture and ask for Crop Reports published by the Secretary of Agriculture which will show distribution of products and give valuable statistics; this will furnish supplementary work correlated with Geography

Arithmetic:

Give supplementary problems with the lesson in arithmetic; have practical agricultural problems; they should combine the facts of agriculture with mathematical training; feeding problems; balanced rations; nutritive ratio; mixing of fertilizers; mixing sprays; construction of buildings; silos; cribs; granaries; tile drains; fences; road building; ditching; problems in seeding; planting and harvesting of wheat, corn and other crops; marketing; egg production; trade problems; make all problems practical and applicable to the every day transactions of the community by consulting the daily market reports.

Plants:

Study a tree and name different parts; functions of parts; plant foods; sources of nourishment; study relations of air and leaves; roots and soils. Learn to recognize some of the common trees of the forest; name the best kinds of firewood; some of the best commercial woods; study treatment for lengthening the durability of buildings, post, ties, paving blocks, shingles.

Review study of flower and weed specimens in your herbariums. Distinguish underground stems, bulbs, and tubers from roots; collect exhibits of each.

Study plans for the home garden; for experimental plots; make collections of flower and vegetable seeds; prepare seed testers; construct cold frames, hot beds and study methods of propagating plants.

Send to some good seed house for catalogue; make selections for spring seeding; toward spring test the germinating power of seeds.

Send to the Ohio Experiment Station for the following bulletins: The Spray Bulletin; The Ohio Weed Manual; Ohio Plant Diseases.

Discuss plans whereby a boy could produce the greatest income from an acre of ground; a farmer on ten acres; on twenty acres; on forty acres; on eighty acres.

Have corn judging contests; organize for a corn growing contest; form boys' and girls' agricultural clubs. Hold agricultural exhibits.

ANIMALS:

Observe how the chipmunk, woodmouse, woodchuck, and muskrat prepare for winter; how they live; animals that hibernate; make an investigation of what becomes of certain insects and snakes in winter.

Household Pests:

Study methods for the destruction of mice, rats, flies, mosquitoes, moths and other vermin; send to the U. S. Dept. of Agriculture for the following bulletins: (Farmers' Bulletins.)

155. How insects affect health in rural districts.

459. House Flies.

369. How to Destroy Rats.

383. How to Destroy English Sparrows.

Send to the Bureau of Entomology, U. S. Dept. of Agriculture for circulars:

34 — House Ants; 36 — The true Clothes Moths; 47 — The Bedbug; 48 — The house Centipede; 51 — Cockroaches; 71 — House Flies; 108 — House Fleas.

Send for circular 76 — List of Publications of the Bureau of Entomology.

Name the fur-bearing animals of your locality; explain causes for difference in values of winter and summer furs; name some animals that yield most valuable furs; study effects of cold weather on the hair of domestic animals; observe effects of blanketing horses; note the change of colors between summer and winter in fur-bearing animals.

Observe difference in quantity of feed required between summer and winter; explain causes; explain balanced rations; why hens fed on corn alone may be fat, but not produce many eggs; observe difference in feeding beef and dairy cattle. Will a feed that produces fat be the same as that which is a good producer of milk?

Study the products of milk and beef; name the uses of hides, leather, bones, tallow, fat, hoof, hair, and other parts of slaughtered animals; what great industries are dependent upon the production of cattle, sheep, hogs and poultry?

Observe difference between herbivorous and carnivorous animals; name some that live on both flesh and vegetables; study the dog and his relatives; the cat and his relatives; name some

animals that live in water and some that live both on land and in water; can we always distinguish clearly between plants and animals? Between organic and inorganic bodies?

Make observations and collections to show how closely the three great kingdoms of nature are merged into one another and how we can scarcely draw the lines of demarkation.

MINERALS:

Secure specimens of iron ore, different kinds of coal, limestone, sandstone, shale, marble and granite; explain how coal is formed from vegetable matter; limestone from shells; sandstone by nature's process of cementing together grains of sand; how shale is formed from mud; uses of limestone, sandstone and granite for building purposes; stones used for road building; how lime is obtained from limestone.

Have a specimen of a well weathered rock; study how clay is formed; sand; pebbles; explain how the different agencies have transformed the rocks into different types of soil.

Study soil water; make experiments to demonstrate permeability and capillarity of soils; show the ascent of water in dry soils by use of glass tubes or lamp chimneys; make experiments to illustrate the process of osmosis; show effects of working clay soil when wet; show effects of a mulch to retain moisture; explain irrigation; test soils for lime; test soils for acidity; show effects of freezing, liming and humus on a clay soil.

FARM MANAGEMENT:

Water:

Study different sources for securing water; artesian wells; open wells; waterworks; filtered water; sterilized water; difference between soft and hard water; difference in the city and farm method of getting water; study types of pumps and windmills; reservoirs, tanks and cisterns; methods of heating or cooling for house use or for stock; study how water may become contaminated and contain disease germs such as typhoid; explain danger in using cups found at public drinking places; study new sanitary methods for drinking places.

Lighting and Heating:

Study systems of heating; the fan, steam, hot water, and gas systems; wood stoves and coal stoves; the fire place; study

chimney construction; protection from fire; study combustion; effects of oxygen; observe movements of cold and warm air; a modern system of heating and ventilation; explain principles of ventilation; study principles of the kerosene lamp; of electric lights; gas lights; send to the Standard Oil Company for samples of the products of oil; study nature, use and dangers of gasoline, acetyline, benzine, electricity. Send to Dept. of Public Instruction for Guide to Safety.

Tools and Farm Mechanics:

Send to the Ohio Experiment Station for bulletin No. 227, Farm Equipment; make a list of the tools needed on a farm of 80 acres; study cost as given in above named bulletin; study losses caused for want of care; name the tools that belong to a carpenter's outfit; name some tools every boy and girl should learn to use; study care of tools; preventing rust; name tools of a blacksmith shop.

Study principles involved in the construction and operation of farm machinery; mower, reaper, fanning mill; separator, cream separator, milk tester, pumps, wind mills, engine, electrical apparatus, water power, spraying machinery, seed drills, and other important and complex machines of the farm.

Schools should have courses in manual training; domestic science; there should be baking contests, sewing contests; instruction in household economy; learn to construct handy household articles; ironing boards, broom holders, shelves, cases, boxes, tables and other useful articles.

And above all things else, let the boy have his pocket knife for,

"In the education of the lad,
No little part that implement hath had,
His pocket knife to the young whittler brings
A growing knowledge of material things.

Projectiles, music, and the sculptor's art,
His chestnut whistle and his shingle dart,
His elder pop-gun with its hickory rod,
Its sharp explosion and rebounding wad,
His corn-stalk fiddle, and the deeper tone
That murmurs from his pumpkin-stalk trombone,
Conspire to teach the boy. To these succeed
His bow, his arrow of a feathered reed.

His windmill, raised the passing breeze to win,
 His water wheel that turns upon a pin,—
 Or if his father lives upon the shore,
 You'll see his ship, "beam ends upon the floor,"
 Full rigged, with raking masts and timbers staunch
 And waiting near the washtub for a launch."

Help the boy to construct these contrivances. Let him observe and do things. Read poems and prose selections that show great power of observation, such as "The Barefoot Boy", "The Brook" and other poems listed in the appendix.

Rural Economics:

Study the relation between location and value of farms; between fertility and value; between fruit, grain and stock farms; points that determine the value of land; why some farms are neglected or deserted; study the laws of supply and demand; location of the best markets; cost of production, transportation and marketing; study crop reports; study the shortage of crops and find the probable demand.

Study the ten great virtues in crop production and farming:

1. Thorough drainage.
2. Soil fertility.
3. Early plowing.
4. Thorough preparation.
5. Testing seed.
6. Scientific cultivation.
7. Clean crops.
8. Timely harvesting.
9. Highest prices.
10. Judicious investments.

Discuss:

Methods by which our mails are carried; distribution; different kinds of roads; effects of good and bad roads on our mail delivery, business, schools, health, transportation and civilization.

How the school can be made the social center of the community; reviving the spirit of the old spelling school; the debating society; the literary club; make the school the home of the

domestic science contest; the agricultural exhibit; the lecture course; the public forum; a place for paintings, sculpture, music, books, flowers, and happy children.

PLANTS:

SPRING TERM.

Begin study of flowers with their earliest appearance in the spring; each pupil should be provided with hand lens and herbariums; make collections of flowers and plants; press and place in herbarium; make drawings and write descriptions.

Study seeds, roots, stems, buds, leaves, flowers, fruits, and functions of each.

Study economic importance of seeds; as a source of food; list of foods from seeds; why food is stored in seeds; compare plant food with animal food; food substances contained in seeds, sugars, starches, oils and proteins; name articles manufactured from the kernel of corn; from other grains; how does the ox prepare the food for us? The cow? Make a microscopic examination of a seed and name parts; by what agencies does nature disperse seeds? Make collections of seeds and arrange in small glass vials.

What forces are necessary for the germination of plants? Name some seeds that germinate first in spring; those that require the greatest amount of heat before germination; conduct experiments to demonstrate effects of different degrees of light, heat and moisture on germination and growth of seeds and on growth of plants; construct seed testers; place seeds in glass jars against the sides so they can be seen after being covered with soil; watch germination and growth; watch the development of the organs of vegetation, roots, stems and leaves.

Roots — Watch the formation of roots and root hairs; the root cap; note growth of stem and root in opposite directions; study anatomy of root and name parts; kinds of roots; compare roots of alfalfa, corn and turnip; examine roots of air plants and parasitic plants; examine change of root of biennial plant the second year.

What difference do we find between the growth of a sweet potato and an Irish potato? Which of these is a root? Which is a part of the stem? What is a tuber? What difference is there in their propagation?

Study difference between stems and roots of plants.

Stems — Examine stems of potato, onion, radish, calamus, timothy, cane, mullein, maple; what are the functions of the stem? Make a list of stems of familiar plants; study difference between a corn stalk and trunk of an oak; observe that one grows from the inside and the other from the outside; observe difference between herbaceous and woody stems; difference between twig and trunk of an oak; study difference in stems that stand upright, those that twine, and those that trail upon the ground. Explain as to direction of growth of grape, ivy, strawberry and raspberry.

Make a list of stems used for food; for building purposes; from which we get products such as turpentine, syrup, sugar, molasses. Study trees that have valuable bark, roots, fruit and leaves. Compare the varieties of economic products from the different parts of plants and decide which part is most valuable. Explain causes of knots.

Buds—Compare a lily bud with the bud of an oak. Observe the several modes of arrangement of buds as they appear on stems, terminal and axillary. Observe nodes and internodes; leaf scars; arrangement and use of scales. Notice difference in branching of elm, oak, beech, pine, fir. Why is this difference? How does it affect the beauties of the winter woods?

Cut buds transversely and longitudinally and examine closely. Examine the folded leaves and position of flower cluster.

Leaves—Examine a young healthy leaf; name parts; uses of each; relation between shape and arrangement; external characteristics; internal structure; transpiration; respiration; the fall of the leaf.

Flowers—Inflorescence; kinds; essential organs; stamens; pistils; pollination; the ovary; make a horizontal diagram of the whole flower; make a vertical diagram; point out the sepals and petals; the calyx and corolla; all important organs; fertilization and cross fertilization; hybrids.

Fruits—What is fruit? Is a watermelon fruit? Use of fruit to the plant; name parts of an apple; examine stone fruit; explain difference between drupe and berry; explain difference between grains and legumes.

Name the ten chief elements of plant food; which of these are least abundant and that usually have to be supplied to our

soils? When a plant is burned what elements escape in the form of gas, as smoke and watery vapor? What remains in the ashes after combustion?

Study differences in varieties of plants; differences in same variety; study causes; how do we improve plants? Why should we study heredity and environment when selecting seeds and plants for propagation? Can we make a good selection of seed without seeing the whole plant? Should a seed ear be selected from a hill of corn having a barren stalk? Why?

Send to the Department of Agriculture, Washington, D. C., and ask for Farmers' Bulletin, No. 157. Propagation of plants. Study different methods; spores, seed layering, tubers, buds, grafts. Note the periods of growth and reproduction; study duration — annuals, biennials and perennials.

Make drawings of trees before leaves appear in spring.

"I see yonder leafless trees against the sky,
How they diffuse themselves into the air,
And, ever subdividing, separate,
Limbs into branches, branches into twigs,
As if they loved the element, and hasted
To dissipate their being into it." — EMERSON.

Note effect of light on color of plants; difference in color of apples on the upper limbs receiving most sunlight and those growing on the lower limbs where there is too much shade; notice the blanching of celery and the shaded leaves of cabbage; place a plant in a dark room and notice how the color will change; how if there is a window it will grow toward the light. Why do trees grow taller in the thick forest than in an open space or field? How does this effect the value of timber? How should we prune fruit trees? Why do we mulch orchards? Study different kinds of mulch; study effect of deep cultivation. Should we hill up corn or potatoes?

Send to U. S. Department of Agriculture, Washington, D. C., for the following Farmer's Bulletins:

- 218. The School Garden.
- 409. School Lessons on Corn.
- 423. Forest Nurseries for Schools.
- 428. Testing Farm Seeds in the Home and in the Rural School.
- 468. Forestry in Nature Study.

Animals:

Study the principles of incubation; care of chicks; care of young farm animals, such as colts, calves, pigs. Read Bulletins and study diseases of young stock; watch for the migratory movement of birds; date of appearance; prepare attractions for the birds near the home, compare damages done with benefits derived from the presence of sparrows, black birds, crows, owls, hawks, swallows, wrens, bluebirds, and thrushes.

Soils:

Find samples of as many kinds of soil as possible; sand, sandy loam, clay, clay loam, silt, silt loam, soil and subsoil; plant seeds in each kind and note results; study effect of water on each kind of soil; note color of soils, where is there more of the organic matter or humus, in the soil or in the subsoil? How does the farmer increase the amount of humus in the soil? On what kind of land do the following crops grow best; apples, peaches, potatoes, alfalfa, timothy, wheat, corn, oats, onions and celery?

THIRD DIVISION.

(Grades 7 and 8.)

FALL TERM.

A text-book on Elementary Agriculture should be used in this division. Give particular attention to the chief farm crop cultivated in your locality.

Study of Corn.—Have pupils bring to school a sample ear of each variety grown on their farms. Compare these and note differences. The ears brought by the different pupils should be labeled and numbered. In studying the different specimens of corn each ear brought to the class should be studied for the following characteristics:

A. Breed Characteristics.

1. Shape and size of ear.
2. Roughness of kernels.
3. Color of ear.
 - (a) Color of grain.
 1. Cap of grain.
 2. Side of grain.
 - (b) Color and size of cob.
4. Number of rows and size of kernels.
5. Shape of grain as viewed in ear.

B. General Qualities:

1. Weight of ear.
2. Weight of grain.
3. Weight of cob.
4. Ratio of grain to cob.
5. Size of kernels—shape, width, depth.
6. Space between grains, between rows.
7. Space between grains.
 - (a) At tip.
 - (b) At crown.
8. Filling out of butts and tips of ears; maturity and seed condition.

- (a) Hardness of grain and cob.
- (b) Dryness of grain and cob.
- (c) Weight of ear in proportion to size.
- (d) Color of ear and grains.
 - 1. Due to immaturity.
 - 2. Due to moisture conditions.
- (e) Color of germs.
- (f) Size of germs.
- (g) Freedom from mold and attack of insects or other injury.
 - 1. Uniformity of grains in:
 - (a) Size.
 - (b) Shape as viewed in ear.

Rules to observe in selecting good seed corn:

- 1. Ears should be of medium size.
- 2. Ears of a bright, healthy color, that are heavy for their size.
- 3. Ears with kernels of uniform size and shape.
- 4. Ears with rows running parallel to the length of the cob, with little space between the rows and well filled out at butts and tips.
- 5. Ears having a uniform diameter; that is, not too pointed at the tip or too large at the butt.
- 6. Ears in which the germ of the kernel is large.
- 7. Ears that are produced under normal conditions.

Diseases of the corn plant. Insects that are injurious. The harvesting of corn. The selection of seed in the field. Methods of building the corn crib. Machinery—corn binders, corn shredders and huskers, corn cutters and corn shellers, etc. Plans for caring for seed corn in Fall and Winter. Experiments for showing shrinkage by keeping over Winter. Weigh a half bushel at harvest time. Weigh the same corn in April. Find loss. Formulate problem for class use showing loss in value when corn is sold in the Spring at Fall prices. Find the prices necessary to receive in Spring to justify loss of weight over Winter. Conduct a Corn Display and Contest. This can be done in connection with your Corn Field Day or other public exercises. Select recitations appropriate to the day. Have an exercise in corn judging where pupils are prepared. Compositions

on "How I Cultivated My Corn", "How I Grew My Potatoes", "How I Managed My Vegetable Garden", and similar subjects.

References: U. S. Department of Agriculture, Washington, D. C.; Farmers' Bulletins, No. 199, Corn Growing; No. 229, The Production of Good Seed Corn; No. 253, Germination of Seed Corn; No. 298, Food Value of Corn and Corn Products; No. 303, Corn Harvesting Machinery; No. 313, Harvesting and storing Corn; No. 617, Lessons on corn.

Write to the U. S. Department of Agriculture, Washington, D. C., for their latest bulletins on corn.

Study of Wheat or Other Grain.:

Make a list of the grain crops grown in your neighborhood. Find the average yield per acre secured of the different grain crops. Account, if possible, for the cause that produced such a difference in yield in the same crop and on the same kind of soil. Was any fertilizer used? If so, what kind? What were the ingredients of same? Were the grain fields sown in clover or other grass? What became of the straw of the grain? Find out how many crops have been grown on different fields since they were in clover or other legumes. What is meant by three year rotation? Four year rotation? Each pupil make a map of his home farm or one with which he is familiar. Indicate on this map the crop that was last grown in each field. Teach pupils to grade grain. What is meant by No. 1, 2, 3 and 4 in grading grains. Write to the Railroad and Warehouse commission, Chicago, Ill. Ask them to send you (teacher) the rules for grading wheat, as fixed by the commission. Rules for the study of other grains can also be secured by writing this commission. Teach pupils plans of treating wheat or other grain to prevent smut. (See text-book.)

References: U. S. Department of Agriculture; Farmers' Bulletins, No 132, Insect Enemies of Growing Wheat.

From Ohio Experiment Station, Wooster, Ohio.

Wheat — Cultural and variety tests, Bul. 82, 118, 129, 165.

Oats — Cultural and variety tests, Bul. 67, 138 and Circular 88.

Diseases of Oats—Bulletins 67, 97, 210.

Helps for Teachers:

(1) The A. B. C. of Corn Culture, by Prof P. G. Holden, Ames, Iowa. This small pamphlet tells us all about the culture of corn from the selecting of the seed to the harvesting of the crop the following year. It is all told in a language of the child.

(2) Farm Friends and Farm Foes, D. C. Heath & Co., New York, tells in simple language something about the things that are really the farmer's friends, and points out the foes of the farmer and how to get rid of them.

(3) Examining and Grading Grains, Ginn & Co., Columbus, Ohio, gives illustrations showing how all good grains should appear and sets forth rules for grading them.

Fruit Study:

1. What varieties are grown in your district? What varieties produce the best quality? Name those that ripen in the summer, in the Fall; which are the best keepers? Which are good "cooking" apples? "Eating" apples? Have pupils bring in a few samples of the Fall varieties. What insects injure the apples in you district? How can this be prevented? Secure "The Spray Calendar" from the Ohio Experiment Station, Wooster, Ohio. Should any one desire to know the "names" of certain apples, the same can be obtained by sending specimens to the Secretary of the State Board of Agriculture, Columbus, Ohio.

2. Where can young trees be secured? Find out all you can about some of the leading nurseries in Ohio. Write to the State Horticultural Society for information on fruit growing. The law of Ohio now requires that all orchards be sprayed at least once a year.

3. Learn the proper methods of planting the apple tree. Why trim the roots? Why trim the top?

4. Pruning is very important. Study your text-book on this subject. See also the State and National Bulletins on "Pruning." What time of the year do the farmers of your district prune their orchards?

5. See text-book on methods of grafting and budding. The teacher can secure a set of grafting tools and can show the pupils how to proceed in this work.

6. Cultivation of the orchard. Are the orchards in your district well cared for? Are they sprayed regularly every year? Are they clean? How about the fence rows? Have they been kept free from orchard trash? Is the land cultivated every year or is it in grass? Is there any mulch about the tree? Could the yield be increased? How? Sometimes old orchards have been renovated, resulting in good profits. How can this be done? Write to Ohio Experiment Station and ask them to send you some literature on the "Cultivation of the Orchard." A few trees well cared for will give better results than a large number that are neglected. In planting an orchard for the home select such varieties that have proven satisfactory in your locality and those that ripen their fruit at different times of the year.

7. Disease of the orchard.

(a) Fungus — Blight, mildew and the scab.

(b) Insect pests — The San Jose scale, codling moth, apple tree tent caterpillar, etc.

Learn to identify these pests. What is an insecticide? Name two. How are they prepared? What is a fungicide? Name two. How are they prepared? For "sucking" insects a kerosene emulsion may be used.

References:

From U. S. Department of Agriculture.

No. 87, Orchards, Cover Crops, and Cultivation.

No. 113, The Apple and How to Grow It.

No. 154, The Home Fruit Garden.

No. 181, Pruning.

No. 198, Strawberries.

No. 283, Spraying for Apple Diseases.

No. 293, Use of Fruit as Food.

From Ohio Experiment Station, Wooster, Ohio.

Orchard Culture, Bul. 171.

Dependable Fruits, circular 55.

Renewal of Old Orchards, Bul. 180.

The Codling Moth, Bul. 160.

Protection of Fruit Trees from Rodents, Bul. 208.

Weeds.

1. The pupil should be taught to recognize the weeds and their seeds that are common in the school district. Field trips may be taken or plants may be brought into the school room for identification. What is a weed? How do weeds travel? Do the weeds of the field differ from those of the garden? Name kinds common in each. Give frequent reviews in weed identification. You can do this by placing a slip of paper containing a number on each specimen and then have the pupils write the name on the paper. Weeds can be exchanged and grading done. Teach only the common name in the elementary school. High school pupils who have had Latin may also be given the botanical name.

2. General characteristics of weeds:

- (a) A very extensive stem growth either erect or horizontal.
- (b) Special adaptation to soil conditions.
- (c) Usually perfect means of seed dispersal.
- (d) Other means of reproduction besides seeds.
- (e) Special adaptation to moisture conditions.

3. Weed control:

- (a) Plow ground early as possible after planting to get the weeds checked.
- (b) Keep the seed beds clean all summer.
- (c) Keep the fence rows and pasture fields clean from weeds that may go to seed.
- (d) Practice crop rotation.
- (e) Plan smothering crop.

4. Weed extermination:

- (a) Apply strong salt water or weak carbolic acid on plants.
- (b) Spraying such weeds as the dandelion, mustard and plantain with iron sulphate.
- (c) Pull them out of the ground so as not to leave any roots.
- (d) Plow as late as possible and follow by frequent harrowing when convenient.

5. Classification:

- (a) Annuals.
- (b) Biennials.
- (c) Perennials.

References: U. S. Department of Agriculture, Farmers' Bulletins.

No. 28, Weeds; and How to Kill Them.

No. 86, Thirty Poisonous Plants.

No. 188, Weeds Used in Medicine.

From the Ohio Experiment Station, Wooster, Ohio.

Weed Manual, Bulletin 175.

Spraying for Weeds, Circular 102.

Insects.

Learn to recognize as many useful and injurious insects, as may be found conveniently in your district. Distinguish between the moth and the butterfly. See "Coulter-Patterson's Practical Nature Study" or Hodge's "Nature-Study and Life," for supplementary work in nature on insect life. Learn the life stages of the insect. Observe specimens illustrating the different stages in a few common insects. Learn the parts of the insect. Flies and mosquitoes can be studied in the Physiology class. Teach the children to see the relation existing between the insect world and the bird world; between the insect world and the plant world. Make a collection of useful and injurious insects to the farmer. Distinguish between the "biting" and the "sucking" insects; insect destroyers — birds, toads, etc. What birds live largely on insects? Why should these birds all be protected by law? Learn how to prepare a good insecticide.

References: U. S. Department of Agriculture, Bureau of Entomology: — Circular No. 16, The Larger Corn Stalk borer; Circular No. 67, The Clover Root borer; Circular No. 73, The Plum Curculio; Circular No. 87, The Colorado Beetle; Circular No. 92, Mites and Lice on Poultry; Circular No. 98, The Apple-tree Tent Caterpillar; Separate No. 355 (Year Book of 1904), Insects' Injuries to Forest Products; Separate No. 381, (1905), Insect Enemies of Forest Production.

U. S. Department of Agriculture, Farmers' Bulletins:

No. 99, Three Insect Enemies of Shade Trees.

No. 196, Usefulness of the American Toad.

No. 275, The Gypsy Moth.

From Ohio Experiment Station, Wooster, Ohio.

Insects Affecting Ohio Shade Trees, Bul. 194.

Spraying Machinery, Bul. 216.

For San Jose Scale, Bul. 169, Circular 69.

For Grape Rot, Bul. 130.

Chinch Bug, Bul. 77 and 106.

Cicada, Periodical, Bul. 87.

Hessian Fly, Bul. 107, 119, 136 and 177.

Forage Crops—What grasses are best adapted for permanent pasture? Why? For hay? Why? What are the true grasses? Where do they obtain their nitrogen? Are they beneficial to the soil? Why? What are the clovers? Where do they obtain their nitrogen? How do they improve the soil? Why should the seed of the clovers be planted with the seed of the true grasses for hay crops? Make a study of the "Meadow." What fertilizers are used to aid the growth of grass crops in your locality? Make a study of alfalfa and its culture. Find out the difference in the production and the methods of cultivating the different clovers. Also observe the following outline: When cut? How cured? Number of times cut? Purpose of second cutting. Why is the second growth often plowed under? Number of pounds of seed sowed to the acre? How is it threshed for seed? Yield per acre? Price per bushel? Number of pounds per bushel? Total average income per acre? Average net income per acre?

Classification of clovers:

- (a) The true clovers.
- (b) The medics.
- (c) The melilots or sweet clovers.

The true clovers include: the red (mammoth and medium), the crimson, the alsike and the white.

The medics include the alfalfa and burr clover.

The melilots are white and yellow.

Compare food value of these clovers. Get each kind and teach pupils to recognize them. Note the root system—length, branching and nodules. Make a study of rape, millet, sorghum and other forage crops.

References: U. S. Department of Agriculture, Farmers' Bulletins:

No. 260, Seed of Red Clover.

No. 278, Leguminous Crops for Green Manuring.

No. 315, Progress in Legume Inoculation.

No. 318, Cowpeas.

No. 339, Alfalfa.

From Ohio Experiment Station, Wooster, Ohio.

Culture of Alfalfa, Bul. 181, and Circular 91 and 80.

Forage Crops, Bul. 70.

Soy Beans, Cir. 78.

Millet, Circular 81.

The Farm Grasses of Ohio, Bul. 225.

See An Introduction to Agriculture, by Upham (Appleton) and Agriculture for Beginners, by Burkett, Stevens and Hill (Ginn).

Dairying:

Teach children the meaning of the term "Balanced Ration" and how to prepare a "balanced ration". See First Principles of Agriculture, by Goff and Mayne, (American Book Co.)

Make a study of the silo. Best crops for silage. Why is corn the main silage crop? What kinds of corn are best adapted for silage? Why? At what stage of development should corn be cut for silage? Could good silage be made out of fully ripened corn? Why not? Does the frost effect the corn intended for silage? In filling the silo, why is it necessary to thoroughly pack the corn? Why should the corn next to the outside of the silo be packed more than that in the center? Have pupils bring corn to school that is in the proper condition for being placed in the silo. The parents should be consulted by the pupil in selecting corn in the proper condition for the silo.

References: U. S. Department of Agriculture, Farmers' Bulletins:

No. 22, Feeding Farm Animals.

No. 55, The Dairy Herd.

No. 106, Breeds of Dairy Cattle.

No. 166, Cheese Making on the Farm.

No. 141, Butter Making on the Farm.

No. 32, Silos and Silage.

No. 292, Cost of Filling Silos.

From Ohio Experiment Station, Wooster, Ohio.

Feeding for Beef, Bul. 60.

Tuberculosis of Cattle, Bul. 108.

Silage versus Grain for Dairy Cows, Bul. 155.

Silage for Fattening Cattle, Bul. 193.

Value of Individual Records for Dairy Cows, Cir. 67.

Milk.— Every pupil whose parents are interested in dairying should be taught the use of the Babcock tester. It is one of the most important factors to consider in the dairy business. Schools should be supplied with a Babcock Milk Tester. Teachers everywhere are surprised at the interest that can be aroused in the community by having the pupils test samples of milk and cream.

Pupils should also be taught:

- (1) The care of the milk cans and pails.
- (2) What feeding stuffs may effect the flavor of the milk.
- (3) The reason for prompt removal of the milk from the stable.
- (4) The necessity of the milker wearing clean clothing.
- (5) The necessity of having cows kept clean and comfortable.
- (6) The necessity of giving the cows good treatment—being kind and gentle with them at all times.
- (7) The necessity of feeding balanced rations.

References: U. S. Department of Agriculture, Farmers' Bulletins:

No. 42, Facts about Milk.

No. 63, Care of Milk on the Farm.

No. 348, Bacteria in Milk.

Farm Papers: Do not fail to take a good farm paper to your school for the use of the pupils. Get them in the habit of reading these papers. See list suggested in appendix. Secure samples of these journals and see that the pupils have access to at least one of these papers.

WINTER TERM.

Give particular attention during the winter months to the study of "Housing and Protecting Farm Animals." Secure photographs of pictures of the common farm animals raised in Ohio. Pictures can be taken from Agricultural bulletins and agri-

cultural newspapers. Teachers should also have the pupils visit a stock farm where pure-bred animals are kept. The owners or keepers of these animals will be glad to explain to the children about the plans of caring for the animals, leading characteristics, etc.

The following outline is suggested for use in connection with the study of Farm Animals:

Farm Animals.

1. Horses.
 - (a) Origin and distribution.
 - (b) Types and breeds — their characteristics.
 - (1) Draft — English Shire, Clydesdale, Percheron, French Draft, Belgian, etc.
 - (2) Coach — French Coach, German Coach, Cleveland Bay, Hackney, etc.
 - (3) Roadsters and Light Harness — American Trotter, The Thoroughbred, The American Saddle Horse, etc.
 - (4) Ponies — Shetland, Indian ponies, Mustangs, Welsh Polo, etc.
2. Cattle.
 - (a) Origin and distribution.
 - (b) Types and breeds — their characteristics.
 - (1) Beef — Shorthorn, Hereford, Aberdeen-Angus, Galloway, Sussex.
 - (2) Dairy — Jersey, Guernsey, Ayrshire, Holstein-Frisian, Brown Swiss.
3. Swine.
 - (a) Origin and distribution.
 - (b) Types and breeds — their characteristics.
 - (1) Large Breeds — Chester White, Improved Yorkshire, Tamworth.
 - (2) Medium Breeds — Berkshire, Poland-china, Duroc-Jersey.
 - (3) Small Breeds — Small Yorkshire, Essex, Victoria, etc.

4. Sheep.

- (a) Origin and distribution.
- (b) Types and breeds — their characteristics.
 - (1) Fine-wooled — American Merino, Delaine Merino, French Merino and Cheviot.
 - (2) Medium-wooled — Southdown, Shropshire, Dorset, Hampshire, Oxford, etc.
 - (3) Long-wooled — Cotswold, Leicester and Lincoln.

References: Bulletins from the Department of Agriculture, Columbus. Bulletins from the Agricultural College, Columbus, O. U. S. Department of Agriculture, Washington D. C., Farmers' Bulletins:

No. 96, Raising Sheep for Mutton.

No. 159, Scab in Sheep.

No. 170, Principles of Horse Feeding.

No. 179, Horseshoeing.

No. 205, Pig Management.

See also Bulletins mentioned under Dairying in the "Fall Term".

See also the book — Types and Breeds of Farm Animals by Charles S. Plumb.

Use supplementary text books and helps for teachers recommended in "Fall Term".

Bulletins from Ohio Experiment Station, Wooster, Ohio:

No. 195, Feeding work horses.

No. 91, 117, Lung and stomach worms of sheep.

No. 179, 187, Fattening range lambs.

No. 73, (Circular), Tankage for hogs in cattle feed lots.

No. 209, Rations for fattening swine.

No. 213, Specific effects of rations on the development of swine.

Farm Machinery — Kinds, uses, value, care of. History to show improvement. Catalogues from concerns where farm machines are manufactured can be secured for school use.

Soil Study — Test soil for acid and alkali. What elements are usually lacking in soils? How can they be secured? Secure samples of commercial fertilizers in small bottles. What are the ingredients of each? Samples of phosphate rock and other

fertilizing materials can be secured for school use by addressing fertilizer factories. Make a collection of soils in small bottles. Test the soils for their power to retain water and for capillarity. Teach uses of tile drains. Soil improvement. Influence of Crop Rotation on Soil Improvement. Saving soil moisture. Soil water. Soil mulch. Plant food in soil. Renewing old soil. Value of the clovers in soil improvement. Mixing of home fertilizers. Study methods to improve Ohio's soil. Influence of tillage on soil. Soil must be improved to support increased population. Perform experiments in connection with the study of soil.

References—U. S. Farmers' Bulletins:

- No. 77, Liming of Soils.
- No. 83, Tobacco Soils.
- No. 88, Alkali Soils.
- No. 257, Soil Fertility.
- No. 266, Management of Soils.
- No. 406, Soil Conservation.
- From Ohio Experiment Station, Wooster, Ohio.
- No. 159, 141, Lime as a fertilizer.
- No. 182, 183, 184, Maintenance of fertility.
- No. 59, (Circular), Soil Treatment of Tobacco Beds.
- No. 79, (Circular), Requirement for Ohio Soils.

SPRING TERM.

Poultry Raising:—Breeds of chickens of the neighborhood; characteristics of each; feeding, housing and general care. Incubators and brooders; expenses and profits in poultry.

1. Points to be observed in caring for eggs for hatching:—

1. Gather every day in warm weather and every two or three hours in cold weather.
2. Keep in temperature about 60° F.
3. Turn eggs daily.
4. Set eggs less than ten days old.
5. Set regular shaped eggs.
6. Set eggs from the best laying hens.
7. Never set eggs from diseased chickens.

2. Points to be observed in caring for the hen while setting:—
 1. Place her where she will not be disturbed by other hens.
 2. Keep water and shelled corn before her.
 3. Keep box of dust or weak ashes before her.
 4. Dust the hen with insect powder when you set her and every week thereafter.
 5. Take her off the nest as soon as all fertile eggs are hatched.
3. Points to be observed in the care and feeding of young chicks:—
 - (a) Care
 1. Place coops on well drained ground.
 2. Keep coops clean and airy.
 3. Move coops frequently.
 4. Change location every year.
 5. Dust with insect powder, etc., to prevent lice.
 6. Keep out rats, etc.
 7. Keep in small quarters while very young.
 - (b) Feeding
 1. First meal when about 48 hours old.
Bread soaked in milk and squeezed, or boiled egg, then chick feed, fine grit.
 2. Later, coarse corn meal, cracked corn and cracked wheat.
 3. After third week mix a little beef scrap with feed.
 4. Keep fresh water before them. Use drinking fountain if necessary to keep water clean.
 5. Feed three times a day while young.
 6. Small chicks should be fed in separate pens from old hens and large chicks.
 7. Skim milk and cheese are valuable food.
4. Care of cockerels:—
 1. Feed regularly and all that will be cleaned up well. Include beef scrap in rations.
 2. Keep in comparatively small quarters.
 3. Market when the price justifies and cockerels are in good condition.

5. Care of pullets :—

1. Give free range.
2. Worms, beef scrap or green bone.
3. Fresh water and good grain.
4. Keep in clean, well ventilated coops or houses.
5. Avoid having them roost in a draft.
6. Keep out lice and mites.
7. If properly cared for they will lay by early winter.
8. Market surplus stock.

6. Winter egg production :—

1. Breed from winter layers.
2. Use male from good layers.
3. House: well ventilated, clean and dry.
4. Exercise: Feed whole grain in litter.
5. Green food: cabbage, beets, turnips, clover, alfalfa.
6. Give fresh warm water.
7. Avoid causing them to eat snow.
8. Feed warm mash in mornings.
9. Mash can be fed dry or moistened with hot water or warm skim milk.
10. Mash may include corn meal, bran, oat meal, and and about 5% ground alfalfa and beef scrap.
11. Keep fine grit before them.

References: Poultry magazines and journals, incubator catalogues and leading farm papers.

U. S. Department of Agriculture — Bulletins:

- No. 41—Fowls, Care and Feeding.
- No. 51—Standard Variety of Chickens.
- No. 64—Ducks and Geese.
- No. 236—Incubation and Incubators.
- No. 141—Poultry raising on the Farm.
- No. 182—Poultry as Food.
- No. 200—Turkeys, Varieties and Management.
- No. 287—Poultry Management.
- No. 357—Methods of Poultry Management at the Maine Agricultural Experiment Station.

From Ohio Experiment Station, Wooster, Ohio. Ask to be placed on the mailing list to receive all bulletins.

From Maine Agricultural Experiment Station, Orono, Maine:

No. 100—Poultry Management.

No. 168—The Fertility and Hatching of Eggs.

For disease of poultry—get Bulletin No. 138—The Poultry Industry in Maryland, from Maryland Agricultural Experiment Station, College Park, Md.

The Biggle Poultry Book from Farm Journal, Philadelphia, Pa.

Fruit Study—Where fruit raising is practiced extensively, study propagation by grafting, by budding. Why necessary. History of some one fruit from seed to maturity. Pruning, planting and spraying of fruit trees. Secure bulletins (See list mentioned under Fruit Study in the Autumn term). Also write to the Agricultural Commission, Columbus, Ohio, and Ohio Experiment Station, Wooster, Ohio, for their Spray Calendars.

Corn Study—Germination of seed, make corn testers; compare tests for vitality. Grading corn. History of Corn. Varieties adapted to your locality. Planting and Cultivating Methods. Experiment in depth of planting.

Determining Germinating Strength.

NOTE TO TEACHERS: Points to be considered in preparing germinating boxes:

1. Direct pupils to bring to school shallow boxes filled with sand.
2. Have them divide the sand surface into small squares.
3. Number each one of the small squares.
4. Number ears of corn or other kinds of seed to be tested to correspond with the number of each small square.
5. Remove six grains from different parts of ear, number (1) and place in square number (1).
6. Continue this process until all squares are filled.
7. When all squares are filled moisten the sand and keep in a warm place until the corn (or other grain that is being tested) comes up.
8. In the country schools the boxes cannot be kept at school, if the house is not well heated over night. Pupils in these schools should be directed to take the boxes home and keep them where they will not be destroyed until the test is

finished. The sand in the boxes should not be allowed to dry out until the plants have reached an inch or two in height. When the plants (if corn) have reached this height the boxes can be returned to school. The productiveness of each ear of corn may then easily be determined by noting the strength and vigor of the plant produced from each kernel planted. Reject all ears that did not produce strong plants that are uniform in size and all six grains productive. Some seasons it is impossible to get perfect germination in corn but we should get ears as near perfect as possible. See the form following for recording germinating tests.

Form for Recording Germinating Tests.

The following is a convenient form for keeping a record of seed testing that is carried on by pupils:—

Name of Seed: Corn.

Number of Seed in Tester: 200.

Date Started.	Date Sprouted.	No. of Grains Sprouted.	No. of Grains not Sprouted.	Per Cent Sprouted.	Per Cent not Sprouted.
Feb. 4.....	Feb. 10.....	80	120	40	60
Feb. 15.....	Feb. 22.....	100	100	50	50
Feb. 25.....	Mar. 2.....	120	80	60	40
Mar. 3.....	Mar. 10.....	190	10	95	5
Mar. 4.....	Mar. 11.....	196	4	98	2

Source of Seed: Secured from a successful corn grower near home.

Remarks: Only the last show per cents good enough to plant. All sprouts in last two indicate a strong germ.

Name of pupil: Edwin Harkrader.

School: Hillsdale.

Prepare to have a corn, vegetable and flower growing contest during the summer and exhibit the products at the County Fair, or at school early in the fall term.

Always test all seeds for vitality before planting. Treat potatoes for scab with formalin. See text book for method. Examine clover and grass seed with hand lens to find weed seed and other impurities. See other suggestions for Fall Term.

*Corn Record.**

The following Corn Record is Suggested for Pupils Doing Contest Work:

Preparation of Seed Bed.....

 Kind of Soil.....Area of Corn Plot.....
 Variety of Seed Corn.....
 From what place was the Seed Corn secured?.....
 Was it tested to determine whether or not it would sprout?.....
 Date of Planting?.....
 What Depth?

Drilled or Checked?.....
 When Corn appeared.....
 Dates of cultivation and how cultivated?.....

 Purposes of Cultivation?.....

 To what degree was the corn damaged by all causes?.....
 Date of harvesting the ears?.....
 Were the ten ears exhibited selected when the corn was standing or after husking?

.....
 Did you find the variety of corn you used suited to your soil and climate?

.....
 Why?

Witness, outside of family, that can certify, if necessary, that the corn was cultivated and harvested by the person keeping this record.!.
 Address

References: Secure the following circulars from Ohio Experiment Station, Wooster, Ohio.

No. 53—Experiments with Corn.

No. 66—Corn Breeding and Registration.

No. 71—The Selection of good seed corn.

Also No. 428—Testing Seeds—From Department of Agriculture, Washington, D. C.

* This record can be altered so **it may** be used for vegetables and other contests.

Bird Study—

1. Birds should be studied all the year around.
2. Begin with the most common and learn to recognize a few each month. Winter is a good time to begin when there are not many different kinds. Note changes in some species from season to season. Note song, manner of flight, nest, habits and food.
3. Learn the purpose of the Audubon Society.
4. Study the Ohio law for the protection of birds. What birds are protected by law? What other birds should be added to this list? Why should these be added? Name the native birds that are beneficial to farm crops. Injurious to farm crops.
5. Look up your Arbor Day Bulletins for information on birds.
6. Discuss methods of encouraging birds to stay with us. See Hodge's *Nature Study and Life*, pp. 327-345.
7. Which are bird enemies? See Burrough's "Birds and Bees."
8. For suggestive exercises on birds see Coulter-Patterson's *Nature Study*, pp. 112, 122; also 301-313.
9. Study the economical value of birds and the migration of birds.
10. Old nests can be taken to school for study but discourage making egg collections as it leads to the destruction of birds.

Suggestion to teacher: If you desire your class to make a special study of the economical value of birds secure,—"*Birds in Their Relation to Man*" by Weed and Dearborn—published by Lippincott. Other books of interest on the subject of birds are as follows:—

1. *Birds of Village and Field*, Florence A. Merriam, Houghton, Mifflin Co., Boston.
2. *The First Book of Birds*, Olive Thorne Miller, Houghton, Houghton, Mifflin Co., Boston.
3. *Birds through the Year*, Gilmore, American Book Co., Cincinnati.
4. *Our Birds and Their Nestlings*, Margaret C. Walker American Book Co., Cincinnati.

References: U. S. Farmer's Bulletin.

No. 54—Some Common Birds.

No. 197—Importation of Game Birds and Eggs for Propagation.

No. 383—How to destroy the English Sparrow.

No. 390—Pheasant Raising in the United States.

Home Garden Studies—Those persons having had experience with school garden work not only in Ohio but also in other states agree that the home garden is better than the school garden to meet the need of rural children. In the larger villages and in the city, school gardens are without a doubt worth while, but, aside from the experimental work, they are in most cases neither practical nor profitable for the rural boy or girl. There is no question about the value of the Home Garden and the School Garden; the question is regarding its organization and management. The success of either plan will depend largely upon the enthusiasm of the teacher who must take the lead in all garden work. The teacher should plan the work carefully, first getting as much information on the subject as possible from all sources. Garden work successfully done is one of the very best possible means of interesting children in all forms of Agriculture. If it is not carefully planned and cared for after it is started it is likely to be a failure. Perhaps ninety per cent. of the failures in garden work result from the teacher undertaking the work before he has thoroughly investigated the subject and received some plans from other school teachers who have been successful. Then it is generally the case that most teachers ask the children to undertake too much in the beginning. Small gardens in the spring become large gardens when the sun gets hot in summer. Have each child who enters into the work understand that he is not to give up the work until it is completed. It is generally advisable to suggest to the children that they should not undertake to plant more than two or three varieties of plants. The teacher undertaking garden work should have a record book and keep in it the names of the children planting gardens and the kinds of seed grown by each one engaging in the work. These records should be left at the school, as a new teacher may be employed to take charge in the fall and he must have these records. Children should be given credit for all their summer activities in the way of garden or field work. The teacher should visit these gardens as often as possible and encourage the chil-

dren in their work. Very simple records of the work done should be made by each pupil who has a garden.

Be sure to have an exhibit of some of the products cultivated by the children either at the County Fair or at the school house at the opening of school. You can have a "School Fair" of your own if it is not possible for all the children to take a part of their products to the County Fair. Have some exercises in connection with your "School Fair." Invite the parents and school officials to attend the exhibit. Secure some competent person to act as a judge of the exhibit. Simple prizes may be offered for the best exhibit of each kind. It is very often advisable to secure the co-operation, if possible, of the parent in this garden and field work. Speak to the parents about the value of this work to the child and suggest that a piece of land be given to the child on which he may raise whatever he desires, and that he be allowed the profits obtained from the crops. The child should keep an account of the income and expenses. Teach him to see the business side so that he may better understand the question of farm economics. If the crops are used by the parents, the child should be compensated for it.

References — U. S. Department of Agriculture. Farmers' Bulletins.

No. 154—The Home Fruit Garden.

No. 218—The School Garden.

No. 255—The Home and Vegetable Garden.

No. 256—Preparation of Vegetables for the table.

No. 385—Boys' and Girls' Agricultural Clubs.

No. 408—School Exercises in Plant Production.

No. 409—School Lessons on Corn.

No. 468—Forestry in Nature Study.

Social Life of the Rural Community.

The teacher should become a leader in educational matters in the community. Various plans may be carried out to bring this about. The following are suggested:

1. Parents' Meeting where exercises are given by the children. This gives the teacher and patrons an opportunity to become better acquainted.

2. Agricultural Clubs, where pupils are given an oppor-

tunity to express their views on different phases of Agricultural work and at which time contests may be held.

3. Rural Lecture Courses, where all departments of education may be presented.

4. Farmers' Institute. Teachers should interest themselves in the promotion of Farmers' Institutes.

5. Township and Village school displays should be encouraged, consisting of all work done in school.

6. Traveling Libraries should be secured from the state library. Any one interested in getting the use of good books free should write the State Librarian, State House, Columbus, Ohio.

7. Encourage County Fair Boards to offer prizes on Agricultural products cultivated by your pupils.

8. Give your encouragement to all of the Farmers' Organizations that are promoting Agricultural Education.

NOTE TO TEACHERS.—If your pupils or patrons are especially interested in any of the following topics in this course of study, they may write to the addresses that are mentioned below:

Orchards and Trees—W. J. Green, Wooster, O.

Dairying—Oscar Erf, O. S. U., Columbus, O.

Soils and Fertilizers—C. E. Thorne, Wooster, or to Alfred Vivian O. S. U., Columbus, Ohio.

Plant Diseases—A. D. Selby, Wooster, O.

Forestry—J. J. Crumley, Athens, O.

Birds—Dr. Eugene Swope, Secretary Audubon Society, Cincinnati, Ohio.

Quail—Dr. H. C. Minnich, Oxford, O.

APPENDIX.

SELECTIONS WHICH MAY BE USED IN CONNECTION WITH THE SUBJECTS MENTIONED

Birds:

To a Waterfowl—Bryant.
The Winged Worshippers—Charles Sprague.
The Bobolink—Bryant.
To a Skylark—Shelly.
The Sandpiper—Celia Thaxter.
The Skylark—James Hogg.
The Wounded Curlew—Celia Thaxter.
The Birds of Killingworth—Longfellow.
The Singing Lesson—Jean Ingelow.
Robin Redbreast—William Arlingham.
The Winter-king—Selected.

Flowers:

Daffodils—Wordsworth.
The Bluebell—Selected.
The Flower—Tennyson.

Trees:

A Forest Hymn—Bryant.
The Planting of the Apple Tree—Longfellow.
Woodman Spare that Tree—Morris.
Woods in Winter—Longfellow.
How the Leaves Came Down—Susan Coolidge.

Nature:

The Brook—Tennyson.
Break, Break, Break—Tennyson.
The Wanderer—Eugene Field.
The Ocean—Byron.
The Chambered Nautilus—Holmes.
Thanatopsis—Bryant.
The Stranger on the Sill—Thomas Buchanan Read.
The Cloud—Shelley.
Darkness—Byron.

The Seasons:

The Death of the Flowers—Bryant.
September—Helen Hunt Jackson.
October's Bright Blue Weather—Helen Hunt Jackson.
The First Snowfall—Lowell

The Seasons — Concluded.

Freaks of the Frost — Hannah Gould.
 Snow Bound — Whittier.
 It Snows — Sarah Hale.
 Midwinter — Trowbridge.
 The Dying Year — Prentice.
 The Snowstorm — James Thomson.
 A Summer Longing — George Arnold.
 Spring Again — Celia Thaxter.
 March — Wordsworth.
 April Day — Caroline Southey.
 The Rainy Day — Longfellow.
 Work — Eliza Cook.
 Sowing and Reaping — Adelaide Proctor.
 The Song of the Sower — Bryant.
 The Summer Shower — Thomas Buchanan Read.

The Rural Life.

The Corn Song — Whittier.
 The Country Life — Stoddard.
 The Old Oaken Bucket — Woodworth.
 The Barefoot Boy — Whittier.
 A True Sportsman — Foss.
 That Calf — Alice Cary.
 The Humblebee — Emerson.
 Thoughts for the Discouraged Farmer — James Whitcomb Riley.
 Evangeline — Longfellow.
 The Deserted Village — Goldsmith.
 Strawberries — Trowbridge.
 The Fountain — Lowell.
 Living on a Farm — Selected.
 The Voice of the Grass — Sarah Roberts.
 Good Night — Selected.

In Nature Study:

Read from Shakespeare:

Queen Mab's Carriage. *Romeo and Juliet* I., 4.
 A Colony of Bees. *Henry V*, I., 2.

Read Eve's description of Eden, in Book IX Milton's *Paradise Lost*.

Students should be encouraged to hunt for beautiful quotations from the best authors that are applicable to the subject under consideration.

TEXT-BOOKS IN AGRICULTURAL EDUCATION SUITABLE
FOR THE 7TH AND 8TH GRADES OF THE ELEMEN-
TARY SCHOOLS.

<i>Name of Text-book.</i>	<i>Name of Author.</i>	<i>Publishers.</i>
Agriculture for Begin- ners	Burkett, Stevens & Hill.	Ginn & Co., Columbus.
Agriculture for Common Schools	Fisher & Cotton.....	Chas. Scribner's Sons, N. Y.
Productive Farming ...	Kary Davis	J. B. Lippincott Co., Philadelphia.
Rural School Agricul- ture	C. W. Davis.....	Orange Judd Co., N. Y.
Elementary Principles of Agriculture	Ferguson & Lewis.....	Hall & McCreary, Chi- cago.
Practical Lessons in Agriculture	Ivins and Merrill.....	American Book Co.

The above books are also suitable for an elementary school library and for the library of a teacher.

TEXT-BOOKS IN AGRICULTURAL EDUCATION FOR THE 5TH
AND 6TH GRADES OF THE ELEMENTARY SCHOOLS.

<i>Name of Text-book.</i>	<i>Name of Author.</i>	<i>Publisher.</i>
An Introduction to Ag- riculture	A. A. Upham.....	D. Appleton & Co., Chicago.
One Hundred Lessons in Elementary Agri- culture	A. W. Nolan.....	Rowe, Peterson & Co., Chicago.
First Principles of Ag- riculture	Goff & Mayne.....	American Book Co., Cincinnati.
Beginnings in Agricul- ture	Mann	The MacMillan Co., Chicago.
Elementary Agriculture.	Hatch & Hazelwood...	Rowe, Peterson & Co., Chicago.

PAPERS AND MAGAZINES THAT AID IN THE TEACHING AND STUDY OF AGRICULTURE.

American Agriculturist	Orange Judd Co., New York.
Ohio Farmer	Lawrence Pub. Co., Cleveland, O.
National Stockman and Farmer.....	Pittsburg, Pa.
Farm and Fireside.....	Springfield, Ohio.
Farm Journal	Philadelphia, Pa.
Reliable Poultry Journal.....	Quincy, Ill.
Ottwell's Farmer Boy (especially for boys and girls studying agriculture in school)	Carlinville, Ill.

LIST OF AGRICULTURAL APPARATUS FOR A FIRST GRADE ONE-ROOM RURAL ELEMENTARY SCHOOL.

We recommend a set of good tools and as much home-made apparatus as may be convenient for the pupils to make.

Select apparatus to the value of \$15 from this list.

	<i>List Price.</i>
1 Babcock Milk and Cream Tester. Cut gears with 4 cream bottles, pipette, acid measure and test bottle brush, with complete directions for use.....	\$5 50
1 Pruning Shears, 9 inches long. Hand forged, polished tool steel blade, lock nut, volute spring, malleable iron handle	\$0 45
1 Pruning Saw, flat steel back, narrow tapered point, best steel blade, 18½ inches long.....	1 25
1 Tree Pruner, with pole 10 ft. long.....	1 35
1 Pruning Knife. Finest quality blade.....	55
1 Budding Knife. Same quality as above.....	25
1 Grafting Chisel. Curved blade 3½ inches long. Chisel point ½-in. wide. Total length 10 inches.....	1 10
1 Mallet, round, hardwood; 3 in. face.....	22
1 Trip Scale. Capacity 2,000 grams with graduated beam, with range of 10 grams in 1/10 gram divisions....	6 65
1 Set of (5) Dry Measures, 1 qt. to ½ bu.....	1 50
1 Set Weights for Trip Scale; 1,000 grams to 5 grams...	1 20
1 Microscope	44 up.
1 Chemical Thermometer, double scale; -10° to 110° Centi- grade; 17° to 220° Fahrenheit.....	80
12 Test Tubes, 6 x ¾ inches.....	30
6 Wide Mouth Bottles, flint glass, 8 oz.....	30
1 Test Tube Rack, for 6 tubes.....	25

	<i>List Price.</i>
1 Riker Mount, 4 x 5 inches.....	15
1 Riker Mount for insects, 2½ x 3 inches.....	12
1 Riker Mount, 5 x 6 inches.....	19 -
1 Seed Corn Grader, double screen, to take out both the small grains and the large, irregular shaped grains	1 25

For suggestions or a more extended list of agricultural apparatus write the State Department of Public Instruction.

The following are some of the firms dealing in agricultural apparatus and school supplies:

The Central Scientific Co.—Chicago, Ill.
 C. H. Stoelting Co.—Chicago, Ill.
 L. E. Knott Apparatus Co.—Boston, Mass.
 Chicago Apparatus Co.—Chicago, Ill.
 W. M. Welch Mfg. Co.—Chicago, Ill.
 The Columbia School Supply Co.—Indianapolis, Ind.
 The Kauffman-Lattimer Co.—Columbus, O.
 Dobson-Evans Co.—Columbus, O.

PUBLICATIONS OF THE DEPARTMENT OF PUBLIC
INSTRUCTION.

1912

- *Manual of Uniform Course of Study.
- Report of Commissioner of Common Schools for 1910-1911.
- *School Laws.
- *Uniform Course of Study in High School Agriculture.

1913

- Library and Apparatus for High Schools.
- Planning and Adorning the Farmstead and School Grounds.
- Report of Commissioner of Common Schools for 1911-1912.
- Report of the State School Book Commission.
- Review of Educational Progress in Ohio (Vance).

1914

- Fundamentals of Physics, Chemistry and Bacteriology in Agriculture.
- Guide to Safety.
- High School Standards.
- Public Education in Ohio.
- Report of School Survey Commission.
- *Report of Superintendent of Public Instruction for 1912-1913.
- Requirements for Standardized Elementary Schools.
- Roster of County Superintendents and County Boards of Education for 1914-1915.
- *School Laws, Advance Sheets.
- No. 1. Normal School Bulletin.
- No. 2. Reports and Other Printed Matter.
- No. 3. High School Directory for 1914-1915.
- No. 4. Certification of Teachers.

1915

- No. 5. Course of Study in Elementary Agriculture.
- No. 6. Arbor and Bird Day Annual.

* Out of print.

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