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"THE SCHOOL GARDEN FROM AN EDUCATIONAL VIEW POINT."

A THESIS

SUBMITTED TO THE FACULTY

of the

COLLEGE OF ARTS AND SCIENCES

of the

UNIVERSITY OF LOUISVILLE

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PROFESSOR W. H. MACCRACKEN

IN CANDIDACY FOR THE DEGREE

of

"MASTER OF SCIENCE."

by

EMILIE YUNKER

1911

## THE SCHOOL GARDEN

From

An Educational Viewpoint-

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### The School Garden=

"School gardens are not intended to create gardeners or farmers but to afford the growing boy or girl an opportunity for many sided developments."

In the school garden the children are taught by one who can inspire them with a love not only for plants, but for everything else that has life and grows, to take care of trees, lawns, flowers, vegetables and such things planted with their own hands. It is a place where the plants together with their friends and enemies have an intimate relation to the child personally; where the lessons are far more vital than anything he can get from books, where the child learns the wonderful story of the plant, the life in the seed, the function of root, leaf, stem, flowers and seed by the closest scrutiny of which he is capable.

Says Celia Thaxter in, "An Island Garden": "Of all the wonderful things in the wonderful universe of God, nothing seems to me more surprising than the planting of a seed in the black earth and the result thereof. Take a Poppy seed for instance, it lies in your palm the merest atom of matter, hardly visible, a speck, a pin's point in bulk, but within it is imprisoned a spirit of beauty ineffable, which will break its bonds and emerge from the dark ground and blossom in a splendor so dazzling as to baffle all powers of description. The



Genie in the Arabian tale are not half so astonishing".

In the school garden, the child is shown how to help or hinder nature, increasing or lessening the yield of his own crops, thereby early learning a valuable lesson-"As he sows, so shall he also reap". Here he must use the sun's heat and light together with air, water and earth. He must husband all the natural forces and learn to master them. By closely observing the work of one species of worm in constructing his burrow, boring a short distance, then lining it, a famous engineer learned to construct tunnels under water, where before this was deemed utterly impossible. There are many difficult problems for which as yet there have been no solution, but which will some day be solved by those who learn of nature and her forces. Nature says, "Watch, learn how I work".

-Purpose of the School Garden-  
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Froebel in his, *Menschen-Erziehung*, says-"Lead children early to think, this is fundamental in child training". To train them early to work and industry seemed so obvious to him as to need no statement. He adds, "The child that has been led to think, is it not led at the same time to industry and diligence-to all virtues of home and country?" Let us hear and heed this and not allow any child to grow up thoughtless and idle.

The school garden affords one of the best opportunities for the development of the child where he is trained to think and work. When once a child is trained along the lines of activity, he'll unconsciously form habits of industry which are sure to be carried into the school room where the most perplexing problems are solved, and later on into



the larger school of life.

Whatever the special purpose of the school garden, this should be kept in mind: the far-reaching influence that will pervade a neighborhood from a successful garden, will so inspire pupils and parents as to encourage them to make gardens at home, where plants may spring up as restful, cheerful bits of color. Its influence should be far reaching. It wasn't long before a mutual interest was established between pupils and neighbors at the Normal School, after a hardy garden, quite unheard of in that part of the City, had been established. Intelligent questions were asked the children about their plants. Exchanges were made, marigolds and pepper seedlings were offered for live-forever, seeds of the castor bean for a clematis, and a Dorothy Perkins Rambler. Hundreds of Maximilian Sunflowers and other hardy plants found their way to home gardens and several charitable institutions, the members of the City Beautiful Club of the Normal School, helping to plant them.

These children were surprisingly successful with their first attempt at raising California Privet from cuttings made at school in the Fall, and were able to distribute enough plants this Spring among the neighbors to make three hedges; all were grown in a hot bed of their own making.

#### -Why Early Interests Should Be Enlisted-

Gardening must be begun early. "Give the child large interests and give them early". If habits of indolence and carelessness have been formed and vicious tastes have been allowed to develop, the reformation will be difficult, and most assuredly fragmentary and unsatisfactory. Besides we know that it is better to form than to

reform a boy.

This work is so simple, so primitive, that it appeals to every normal child. Long before he can read in a book, the child can begin to read and interpret nature and learn to do many things which will make him dependent upon no one.

It acts as a stimulus. The task will seem light to a boy if he knows that upon its successful accomplishment, he will be permitted to work in the garden. In fact, he doesn't consider it work at all. An indolent and otherwise troublesome boy was encouraged in this way by being allowed to work each day, provided he first solved the problems given him. Though simple at first, these were gradually increased until he could master anything set before him. It was not long before he was one of the brightest and best in his class. The children who helped clean up a vacant lot, made it not only sanitary but attractive—a joy to the passerby and a source of constant pleasure to the neighbors. The flowers were beautiful; the radishes, beans and lettuce fresh and crisp. The children said, "they were the best we have ever eaten." Their efforts were crowned with success. They had actually achieved something. Not one considered it work, to them it was play. When the lot was sold and a house built upon it, no one regretted it more than the children. Said one little fellow, "we can't have any more fun now".

These boys had played there before, but had become such a nuisance to the neighbors by breaking windows with their ball playing, jumping the fence and breaking the flowers, that the owner of the lot was constantly being appealed to with the request that a stop be put to



the annoyance. After the garden was established not one complaint was made against the children. No more trespassing, no more destruction, and no more vandalism.

The children in the kindergarten should have their garden where they can dig and delve to their heart's content and sow seeds of plants which mature quickly. A friend when asked why she was such an enthusiastic gardener said: "I had two Grand-mothers when I was a child, who gave me seeds from their gardens. They taught me gardening and on my fifth birthday, presented me with a set of tools. The love of gardening increased as I grew older until now it is almost a passion with me. How I wish that every child might be given a garden. Until I was a grown woman, mine was in a back yard in the City; though small, a source of great happiness. Now I have peach and pear trees, a tomato bed, lilac bushes, bridal wreath, burning bush, weigelias, honeysuckle, clematis, rose bushes and no end of flowers from seeds and plants that I put out each Spring. And last, but not least, are the shade trees and a lawn which forms a gentle, sloping terrace to the side walls. It all started from a little, city garden measuring about 18 inches square, on my fifth birthday."

-Its Evolution Including Different Types-

Although school gardening is practically in its infancy in America, the study of gardening originated many years before Christ when Cyrus the Great, Persian King, laid out gardens for the benefit of instructing the sons of noblemen in horticulture. Little is known of the work for more than 2000 years. During the 16th. Century, botanical gardens were established by the Italian University and in almost all the important Italian cities. Educators soon realized their



importance and Comenius declared, "A school garden should be connected with every school where children can have the opportunities for leisurely gazing upon trees, flowers and herbs and are taught to enjoy them."

One hundred years later, Rousseau in his "Emile", laid great stress upon school gardens as a factor in education. Campe with his wards planted ten thousand trees. Salzman wrote, "School gardens have been laid out neither to draw the attention of passersby nor give great returns, but to instruct." Pestalozzi taught his pupils in both field and garden and said, "I wish to make my estate the central point of my agricultural efforts." Froebel established gardens in all the large cities of Europe.

By royal edicts both Austria and Sweden, took up the school garden movement. In Sweden, there are about five thousand. In Austria, according to the Imperial School Law, enacted March 14th, 1869, it was decreed that a garden for conducting agricultural experiment should be established in every rural school.

The Agricultural Society of Switzerland, not only encouraged but gives financial support to the movement. Here emphasis is placed upon the pedagogic and the utilitarian value of the school garden. The nature work is a part of the regular curriculum. Its aim is pedagogical, the utilitarian information is incidental. In 1882, the schools of France were reconstructed and improved. A primary course has been outlined for the first instruction in agriculture and horticulture in which the pupils acquire some knowledge of soil, fertilization and field work. In the upper grades the pupils are instructed in theory and in practice. In 1887, a decree went forth that no school building in the Country to which the State contributes shall be accepted without a

school garden be attached.

In Belgium, horticulture is compulsory. The teacher must be qualified to give instruction, theoretical and practical in vegetable culture. There each elementary school must contain a garden measuring at least thirty-nine and one-half squared rods.

It is conceded that the agricultural and horticultural progress of all Europe had its beginning in the school garden.

Berlin, has a garden attached to each of her schools. In addition, there is one central garden containing about ten acres. On regular distribution days, 50,000 to 100,000 specimens are sent to school for biological and botanical study. The daily papers announce previously the kinds to be sent. Classes visit the garden to study the growing plants and trees. No unsightly spots here. There are vacant lots, divided into small plots apportioned out to those who apply, including men, women and children. Use is made of every inch of ground. Those who have no gardens about their homes, have the opportunity of growing a few vegetables and flowers.

At Pirna, near Dresden Germany, there is a school yard with three attractive summer houses, a small forest of native trees, an Alpine garden, a rockery and pond containing gold fish, all work done by the pupils under supervision.

In all Europe, the fields and roadsides from village to village, the gardens everywhere, are marvels of beauty. The humblest cottage is surrounded by small fruits, such as Alpine strawberries, raspberries and currants. Where there is no space for a garden, a grapevine, an ivy or a wisteria is neatly trained over the front of the house. Planting in window boxes is another favorite way of gardening.



In France, irises are grown on thatched roofs and on old but not unsightly stone fences. Vineyards are planted along the sides of the hills, no matter how steep they are. At Lausanne, Switzerland, close by Lac Lemman, there are acres and acres of sloping ground covered with carefully planted grape vines. You wonder at the possibility of producing grapes and are told that, although these grounds are terraced the soil that is washed down by the freshets and the rains is heroically carried up again by the peasants on their backs and put in place again.

It has been thoroughly demonstrated that school gardens are considered an essential part of the educational system in all parts of Europe, yet their introduction in the United States is of comparatively recent origin and nowhere regulated ~~regulated~~ by law. But there are some in America who have given much valuable time in studying the movement, and in consequence a number of school gardens have been introduced in some of the larger cities of our Country.

#### -Our Pioneer School Gardens-

Of the pioneers, Boston takes the lead, supported by the Outdoor Art Association and the Massachusetts Civic League. A school of horticulture was established in Hartford, Conn. by the Rev. Francis Goodwin in 1900, to give opportunity for individual work and graded training for the boys of the Watkinson Farm School. When Mr. Memenway took charge the work was considerably broadened, including boys and girls from the City, teachers' classes and gardens for adults.

Another pioneer, model garden is that of DeWitt Clinton Park School Farm of New York, begun in 1901, by Mrs. Henry Parsons. Here each child had a plot, four feet by eight feet. By planting two crops,



one in May, the other in July, a thousand children, who otherwise would have to grow up in the streets, were given occupation. Schools and visiting classes were supplied with nature study material. Cripples were taken to bask in the sunshine and allowed to spend some pleasant hours working in their individual plots. To appreciate the good accomplished in this garden one should see it. There is nothing like it in the entire neighborhood. It is the salvation of the children in this crowded tenement district.

#### -Model Gardens Up To Date-

The school gardens at Yonkers, N.Y., Philadelphia, Pa., the graded work at Washington and Cleveland, take the lead and give to these cities the prestige of being the only ones in which the Boards of Education fully realize from an educational standpoint, the value of the school garden. In each City, there is a supervisor to whom is given authority and suitable appropriations for the work. The district of Columbia has a Congressional appropriation of \$1200. for school gardens and appoints Miss Susan Sipe, one of the teachers at the Normal School at a nominal sum as supervisor of Nature Study and School Gardens. There the work is so systematized that a certain amount of gardening is required, just as necessary as reading, arithmetic, drawing and other branches.

Washington has four large school gardens on vacant lots. In addition one hundred school grounds for white children and fifty for colored children are decorated. The children have had some part in the planting and care of all but three of these. Miss Susan Sipe has also been appointed Collaborator in the Bureau of Plant Industry and is furnished with a green house for the instruction of Normal

students. The Department of Agriculture and Bureau of Industry work together, furnishing the supervisor with plants, seeds and other material.

At present the school garden work has so grown in importance that a school garden Department has been established with Mr. Dick J. Crosby at the head. Many bulletins for teachers have been issued and read by thousands. The three most called for are, No. 195 Annual Flowering Plants, No. 218, The School Garden, and No. 154 Tree Planting on Rural School Grounds. No. 204, Gardening and Nature Study in English Schools, written by Miss Susan Sipe after a visit to England, is an unusually interesting bulletin.

#### -History of The Work In Louisville-

School Gardening here is no longer in its infancy. If there is one thing of which we are truly proud, it is the steady growth of this work increasing in value each year, until at present wherever space will permit of a garden, one is made. For some years, there have been window gardens at several schools for decoration as well as study. With nothing but a small grass plot in the front yard at the Normal School an experimental garden was conducted in 1899, in a back yard three squares away.

Eleven children formed a thoroughly wide awake organization, and called themselves, "The Gardeners' Club." Here the children worked all vacation raising flowers as well as vegetables. They received instruction in soil preparation, planting, transplanting, cultivating, watering and weeding. One boy who never could be persuaded to eat a tomato, ate the one he raised, declaring it was the best thing he had



ever eaten. One frosty afternoon, at the end of the season a party was given the children where the corn they raised was popped over a grate fire. There was enough for all and some to be taken home. This was the first school garden in Louisville and the beginning of a movement which has since spread over the entire City, not only for the care and beautifying of the premises, but in some schools for instruction leading to the managing of gardens at home.

So successful was this venture that there was an earnest desire to have a garden for the planting of vegetables at the Normal School. But this yard was paved as most school yards were at that time.

This did not dampen the ardor of those interested. The bricks were removed and good soil and street sweeping hauled in by the boys who became quite enthusiastic about the work. This garden measured seventeen feet by twenty-five feet and contained twelve small plots, one for each class, from the Kindergarten up through the grades, including the Normal classes.

In order to improve the general appearance of the entire yard, without restricting the playground, two feet of bricks and gravel all along the fence in the girls' yard were removed. The stone along the fence in the boys' yard prevented any gardening, but the boys have the same privileges as the girls in the garden which they helped to make. In four months the fence was entirely covered with maderia, balsam and cinnamon vines, to which three varieties of clematis, honeysuckle ramblers, English and Boston Ivy have been added. From the woods the children brought cross-vine, trumpet creeper and Virginia creeper, for fence coverings. In the border were placed coreopsis, shasta daisy, several varieties of iris and such shrubs as Rose of Sharon,



hardy Sunflower, weigelia, burning bush, hardy hydrangea, flowering almond, mock orange and golden bell. Not the least interesting is the wild flower garden; the plants therein contained were a gift from the children of Berea College to the kindergarten of Louisville. The Normal School garden being considered the best place for them, the wild flowers were sent there. Since that the older children have added buttercups, May apples, bluets, wild ginger, wild poppies and anemones, which they found in the woods on their field trips.

Work was begun by planting shrubs in the border along the house and iron fence in the front yard. Gradually more were added, filling in with low, hardy plants and edging with hundreds of narcissi, tulips and hyacinths. When the snow has just about disappeared, there appear the crocuses, followed in quick succession by daffodils, hyacinths, flowering almonds, burning bush, tulips, spireas and all the lovely irises. Then the coreopsis with its blooms of pure gold. Golden glow and the lilies hold forth during the summer. In September, live-forever is in its glory, while as late as October, the Maximilian Sunflower is gorgeous with bloom, single stalks bearing as many as forty-five little sunflowers.

Seeing all this stimulated the children to still greater effort. They enjoyed working a garden which gave them so much pleasure. Here the children learn the A.B.C. of landscape gardening. Straight lines were avoided, space was left open, the lawn smooth and the shrubbery planted in masses.

Vandalism which makes the pursuit of horticulture almost impossible in many neighborhoods, was totally unheard of. Not a flower has been touched, not even the exquisite hyacinths, white, porcelain blue,

and royal purple which bloomed so temptingly at Easter time.

The front gate is never locked. The children have learned the lesson of private care of public property. Instead of being a nuisance, these children have been a boon to the neighborhood.

By the operation of the Superintendent of School and the financial support of the Commercial Club and Board of Education, many yards have been improved, school gardens being introduced during the last four years in about thirty yards.

One of the most successful initial attempts at school gardening reported by the teachers, was carried on by the Portland School. Three hundred and seventy-five plants donated by the Park Commission were distributed among sixteen schools. Those sent to Portland in the Fall of 1902, kept the windows gay for weeks with their bright flowers. As the season advanced the plants were carried into the basement overnight, but in very cold weather this plan became impracticable. Each teacher then called for volunteers to take the plants home and care for them till Spring. Occasionally through the cold winter months there came a sorrowful report of a frozen plant, but more often a record of a new bloom on a geranium, or two new leaves on a begonia revealed the interest with which the plants were watched. With the first warm days of spring the plants were returned.

Some begged to keep the plants they had learned to love. On visiting one home, where the front room served as a tailor shop and living room, a blooming geranium brought by the child from school was the only brightspot in the room. It was decided that the plant stay there and another be purchased for the school garden.



Another boy proudly stated that he had taken nine slips from his plant during his possession of it. The children's enthusiasm was such that the faculty decided to purchase tools. The little plot in front of the school house became transformed into a bower of loveliness. Later twelve dollars and twenty-five cents which had been realized from the sale of beans from this garden, was invested in indoor art for the school room.

Inspiring was the success of the George Rogers Clark School, where a clay bank was converted into a beautiful park enclosed by a California privet hedge. In the Fall was held a splendid exhibit of plants raised in the school room, in the school yard and in the home gardens by the children and grown up in which all Crescent Hill became enthusiastic. Prizes were distributed. A wonderful impetus was given to children and to the civic betterment of this beautiful suburb. In consequence the railway right of way was beautified by roses and shrubs.

One can find no more attractive terminal than this, with its beautiful foliage and lovely flowers unsurpassed by any all along the road from here to New York.

At the Walnut Street School, the bricks in the small front yard were removed, a lawn made, a hedge and flowers planted. The boys became interested. Window boxes were made and filled.

The J.B. Atkinson School had a tulip bed second to none. The transformation of the yard at Brook and Kentucky, with its thousand bulbs, its fence removed, its lawn instead of bricks, its shade trees, was almost beyond belief. All this was the work of the children, under the able supervision of the Principal of the school. Each school had



its own problem.

Looking at the bricks and uninviting yard at one of our schools, a Mother said, "I am not surprised that boys play truant here. 'Tis a wonder that more don't do it."

In order to stimulate the children, circulars containing a list of seeds at one cent per packet and definite instructions for planting .

-As Introducing Simple, Real and Useful

Forms of Nature Study-

Gardening in itself is of the greatest value in the education of children, but it does not perform its proper function unless it has some organic connection with the other work. At the Normal School before planting soil formation was studied in the geography class. The children were taken to a quarry and to a sand pit. They learned that water, air and sun, pulverized rock, that there could be no soil without rock, and the utter dependence upon rocks of animal and plant life. Soil should be treated for its chemical and physical properties. The preparation of the soil can be converted into a lesson on soil physics. The nature of the soil as a source of plant food, as a mechanical support to the plant and as a store house and conveyor of water and air, should be impressed.

Here in the school garden the children learn that though the seeds be the best, the light relation most favorable, the water supply sufficient, if the soil is in poor condition the plants will sicken and die.

Of prime importance is knowing how to treat the soil. The ground

must be properly spaded, turned over, raked and pulverized. Well rotted manure or sweepings from a blacksmith shop must be worked in. When no other fertilizer is available, street sweepings have been successfully used.

By actual experiment, children learn that fine mellow soil will retain moisture and enable the roots to get the food; that soil is a pantry from which the hungry plants draw their nourishment by means of the fine root hairs. Many soils are poor and contain little nourishment, but it is amazing to think of soils full of the necessary plant food, but so locked up that it is not available.

#### -What Is Plant Food?-

Many chemicals constitute plant food, the most important of which are three; nitrogen, potassium and phosphorus salts. Is the foliage fine, green and abundant? The children learn that there is plenty of nitrogen. Now appears a well formed flower. This tells us that potash is available. Good, sound fruit has been fed with potash and phosphorus. If the plant looks sickly, you can be sure it needs nitrogen. If there is trouble with flowers and fruits, potash and phosphorus are needed.

The real key to the food question has to do with the bacteria, good and bad. The good ones act on the soil particles, changing them into food which the plant can use. The bad ones prevent this. To encourage the good, the best conditions must prevail:-

- (1) Plenty of water
- (2) Sufficient air
- (3) Proper condition of the soil.

If the soil is wet and cold in early spring causing it to bake and crack, you can be sure it contains too much clay. Add some sand, and a fertilizer which improves the soil physically by making it more



friable and chemically by storing it with rich nitrogen. We learn by actual test that sand has bad habits, too. The soil particles are so far apart, that the water filters through leaving it hot and dry in the sun. Manure will correct this. Commercial fertilizers can also be cautiously used.

In your indoor laboratory work, observe monocotyledons, dicotyledons. Note where the seed leaves are after planting, where food is stored in the different seeds, how the leaves are formed and manner of growth of bean, pea, corn, squash and morning glory.

If practical, the children should be allowed to do all the work of preparing the soil in the fall, in the spring, the planting of seeds and care of the plants. Seeds should be tested and germinated, percentage noted, thus avoiding a waste of time and energy in a second planting.

#### -Planning And Planting The Garden-

Plan your garden on paper first. The economical use of the area at one's disposal is quite as important as successful planting. In a vegetable garden plant radishes and lettuce, following these quick-growing crops with beans and tomatoes. A third planting of winter onions could follow. This rotation provides for a continuous use of the land and the growing of several crops. Thus the children learn their first lesson in intensive gardening.

#### -Flowers= Annuals, Biennials and Perennials-

"Plants are the missionaries of nature, constantly at work attempting to cover some ugly scar which civilized man has made in his struggle to wrest from the earth the living which he claims that she owes him." If you will but give nature the suggestion of your wishes she will paint for you the rich shade of the phlox and the dianthus



pinks; she will carpet your floor with a velvet rug of green and strew upon it the stars-the dandelions.

While shrubs and trees are needed for a frame work in the adornment of a place, vines, grass and flowers give finish and completeness to the picture. Tall growing annuals such as castor bean, sunflower, cosmos and flowering sage may be used as substitutes until the shrubbery has grown to sufficient size, to command the situation. These cover fences and serve as temporary screens for inattractive sheds and buildings.

Rapidly growing vines, moon flowers, morning glories or cypress can be used for training over fences or shading porches. Planting must be done in a systematic, orderly manner. There is a great moral force in a straight line. Children are apt to plant seeds too close and too deep. Carefully thin out and transplant.

Devote a small plot of ground to food plants, as wheat, rye, oats buckwheat and peanuts; to fibrous plants as flax, hemp cotton; to medical plants, as digitalis, lobelia, liverwort, dandelion, mullein; and to herbs as rosemary, thyme, marjoram, dill, fennel, sage and lavender.

Watering and conserving moisture are important and should receive some attention. Capillarity of the soil should be taught after a rain or a sprinkle, when the surface is dry, children should be taught to go over it with a rake, trowel, onion weeder, or a sharp stick for the want of a better tool, breaking up the surface of the soil, forming a soil mulch, thus lessening capillarity. The water is drawn near the surface when it is needed by the roots of the plants but cannot escape into the air by evaporation.

### -Our Native Flora-

Most people are very ignorant of the wealth of our native flora.

A garden of wild flowers arranged according to systematic classification, affords opportunities for valuable instruction, inculcates an appreciation for the rare and fast disappearing species and engenders a feeling of protection and stewardship. Children should be taken to the woods, but the wholesale removal of plants should be discouraged.

In a garden there should be squirrel, corn, saxifrage, dutchman's breeches, larkspur, buttercups, wild ginger, wild poppies, bluets, anemones, wood ferns, May apples, trilliums, Virginia creeper, crossvine and others growing in the vicinity.

It is neither possible nor advisable to introduce all varieties into the school garden, for conditions are so unnatural they could not live and many resent being taken from their native haunts. The wise thing is to select species which are tolerant of poor conditions and try to improve them under cultivation.

### -Hydrophytic, Mesophytic and Xerophytic plants-

Note the different conditions under which these grow. Observe whether hydrophytic, mesophytic or xerophytic. Classify them. On a rockery, grow live-forever, many varieties of cacti and saxifragas which prefer xerophytic areas. Let the children observe how well they thrive with comparatively little water. Note how they stand the drought when the other plants succumb.

Splendid botanical gardens of this kind exist in Germany, perhaps the finest is found at Sixt near Geneva, Switzerland. Here can be found every conceivable Alpine flower, edelweiss, many varieties of wild pansies, pinas, Alpine violets and hundreds of others from the

Pyrenees, Jura, Savoy and Alps Mountains. All are properly labeled.

Most lessons relating to adaptation of structure to function can best be given with wild flowers. Simple experiments in plant physiology and ecology can be carried by the children. The relation of leaves to catching and shedding rainfall, arrangement and form of leaves in relation to light; modification of leaves and stems for purposes of support; movement of leaves as a protection against heat and cold; color form, marking of flowers for the attraction of insects for the purpose of cross-pollination, these and more studies of vital importance will make the wild flower garden highly instructive.

Note the damp, rich, loamy soil preferred by the ferns, which grow best in the shade. Observe those plants that grow in the same kind of soil, but prefer a sunny situation.

Grow water hyacinth, duckweed and umbrella plant for the study of hydrophytic plants. Observe where willows, sycamore and water birch are found. Transplant peppermint and water cress, pond lilies and sagittaria, if a suitable place can be made.

#### -The Nursery Forest-

The transpiration of moisture by the plants is one of the causes of rainfall and of the changes in temperature. The elements of forestry can be taught in connection with trees in the arboretum. Seeds of the maple, oak, ginkgo, elm, tulip and magnolia for shade and ornamental trees, grow readily in the school garden, where as experiments can be easily made with those of the apricot, peach, apple, pear, cherry and other fruits.

In view of the fact that the vitality of tree seed varies from one to nine years, the children learn that the seeds of maples, elms,



poplars and willows, should be planted soon after maturity as their seeds have the shortest duration of life. The hickory nuts, acorn, chestnuts and buckeyes, scarcely survive the season.

The seeds of the leguminosae locusts, such as yellowwood, coffee tree and red bud have the longest period of vitality.

Problems in forestry are now confronting our people and our citizens are seeking information which will enable them to act wisely in deciding these momentous questions.

The Thuringian and Black Forest of Germany, perhaps, best show how forestry can be successfully carried on. There are acres of young tender seedlings, some six inches tall, others one foot tall, and so on until you come to vast stretches of the mature firs.

The cause of our floods along the Ohio, for instance, should be taught the children. The teacher may instruct the pupils in her geography class, that these floods are due to the removal of the forests from the Appalachian Mountains, and if this work of forest destruction continues the floods may become worse. Do not tell the children bare, external facts. They were better left unsaid, but lead them to make observations for themselves, thereby learning the influence of forests upon stream flow.

In these garden studies, the children should be encouraged to observe the school grounds and their own back yards; to see what becomes of rain and snow water, how exposed soil is washed and gullied and whether the muddy little torrents transport their burdens, how various kinds of plant growth modify these effects; how gently the rain falls, how slowly the snow melts, and how absorptive is the forest soil—all

questions of tremendous importance concerning erosion.

The children should learn the economic value of our trees. That we must grow trees for furniture, building purposes, railroad ties, tools and farm implements. That every time one is cut down, two should be planted in its place. This is the lesson Germany teaches, where re-foresting is constantly being carried on.

#### -Window Gardening-

This has successfully been carried on in some places, demonstrating that this form of gardening can be carried on where outdoor space is wanting. Make the boxes to fit the window, not to exceed six inches in depth. The best soil is a compost of turfy loam.

Asparagus, sprengeri a drooping variety is ornamental and especially adapted to window gardening.

The Boston fern is one of the most satisfactory plants for this purpose. The Rex begonia is beautiful in form and color and texture of foliage. Wandering jew fills in and hangs over the box. The many varieties of begonias endure shade and are very decorative. It is better to buy good plants that will increase in beauty than cheap ones which will soon have to be discarded.

A box of nothing but English ivy is most attractive both summer and winter, and requires perhaps less care than any other.

Scattered here and there by planting Scillas, crocuses, daffodils, tulips and hyacinths these will be one succession of color from December until March.

#### -The Hot Bed-

A hot bed three feet square would accommodate several hundred

California privet hedge slips which planted in the fall would be ready for transplanting in the spring. Much to the delight of the children at the Normal School, hedge plants which they distributed in the neighborhood were successfully raised in the hot bed at school.

English and Boston ivy can easily be started in a hot bed, also seeds of choice plants, such as pansies, asters, dianthus pinks and carnations.

The hot bed is made by using fermenting stable manure preferably that with a small amount of straw or litter in it to the depth of one foot. Above it place beamy soil, on top sharp sand. A frame eighteen inches in the back and eight inches in front should be used, an ordinary window sash will suffice. Use a board covering or an old carpet for extra covering in severe weather. Water in the morning if necessary rather than at night so as not to reduce the temperature by letting out the heat.

#### -Garden Enemies And Friends-

The children find that many insects attack the plants. The tussock moth can easily be found on maple trees. Many of these were hand picked by children at the Normal School last year. Eggs were counted and destroyed during the winter, so were many bagworms.

The tent Caterpillar is responsible for the unsightly webs which are common in spring as are those of the fall web worm.

The click beetle's acrobatic feats are known to many boys and girls who do not realize that he spends part of his life in the ground as a yellow worm.

The Cicada has a life history full of interest to children. They are all familiar with the peculiar shrill noise made by the male by



means of two drums on the underside of the body. The discarded nymph skins may be found clinging to fences and to the trunks of trees. To watch it emerge from its nymph skin, to observe how the female with its ovipositor cuts slits in the bark of the twigs in which to deposit eggs is most interesting. It remains in the ground sucking juices from the plants as does the Cicada Septemdecim, its near relative which retires to the earth for seventeen years and is commonly called the seventeenth year locust. How to combat these and hold them in check should be the lesson here.

Close observation of the lady-bug will reveal that she is in search of aphids or plant lice, which are so destructive. Associated with the lady bugs are the black ants. These have discovered that by stroking aphids with their antennae, the tiring insects give out drops of honey dew, which the ants devour greedily. They have become so fond of it that they guard the aphids, also protect their eggs over winter, carrying the young to new pastures as soon as they are hatched out.

Children should be taught not to harm the spider. By close observation they will see it destroy mosquitoes and flies.

The toad one of our best garden friends, rids the garden of slugs, pill bugs and other tiny, harmful animals. The eggs may be secured in early spring and the tadpoles can be kept in the aquarium at school for daily observation. Frogs and toads both render great service in the garden and are wonderfully adapted by nature in the structure of the tongue for the work they do.

The house fly, about which so much has been said of late can be greatly checked by a war on filth. Absolute cleanliness in the house

and about door yards will control it. In addition, a weak solution of formalin will kill it.

Too little is known of both harmful and beneficial insects and animals. Only a careful study of these will prove most educative. To combat garden enemies most effectually, it is necessary to have a knowledge of their life histories.

#### -Birds-

If insects destroyed were allowed to live, they would have countless millions of descendants. Were it not for the birds we can safely say there would be no plant life.

Hawks and Owls rid us of the rats. Fly-catchers, kingbirds, pewees, phoebes capture their prey on the wing. Woodpeckers, chickadees, nuthatches and creepers explore the bark of trees for eggs, grubs and ants and render good service to fruit growers and gardeners.

The thrush family-robins, bluebirds, wilson hermit and olive backed thrush, prey upon grasshoppers, crickets, beetles, caterpillars, spiders and cutworms.

The yellow and black billed cuckoos are very valuable to the gardner in destroying the larvae of moths and butterflies. Their food consists of hairy caterpillars, tent caterpillars, fall web worm, tussock worm and many others, the worst of the plant enemies.

The Baltimore oriole is one of our most attractive and beneficial birds, its food consisting of hairy caterpillars and plant lice.

The Cedar waxwing, catbird and robin are fond of cherries and small fruits preferring the wild to the cultivated varieties. In the stomach of three mourning doves were found 23,100 weed seeds. Think what such birds as these mean to our Country. Millions of dollars could

be saved. Is there a farmer in the land who would not welcome as a friend the man who would offer to uproot and kill 23,100 weeds?

-Weeds - Bold Robbers Of The Soil-

"The most human plants after all are the weeds. How they cling to man and follow him around the world. How they crowd around his barns and dwelling, throng his garden, jostle and override each other." Some have food values not to be despised, such as dandelion and mullein. As a pot herb also may be used that pest of the garden, purslane or "pussly". An Eighteenth Century writer speaks of it as being "little inferior to the asparagus".

We relish kale, lettuce, spinach, beet tops and swisschard as greens, but question the use of the pig weed whose tender shoots are as much sought for food in some sections of our Country as were the young branchlets of the common nettle which the early Colonists boiled for pot herbs.

Weeds in some places are cultivated. For instance, mullein in England is planted in the greenhouses and is called the American velvet plant.

Weeds are excellent from an aesthetic point of view. In nature's plan they cover many a waste place and "there is a touch of grim satire in their luxuriance, as if the rough muse were bidding man discover how rich the earth for his own use, how costly his neglect to reap such wealth."

Weeds have their economic value. The despised ragweed, for example, holds to seeds until the birds in winter need them to satisfy their hunger.

But coming to the school garden to find the dock, ragweed, Spanish



needle and purslane stealing the food intended for the plant we have been so tenderly nursing, banishes all their uses from our minds. Children may be fond of the ox-eyed daisy and black-eyed Susan, but we must confess that these are among the farmer's worst enemies along with wild mustard, cocklebur, plantain and Queen Anne's lace. Every country boy knows the milk weed with its juicy stem, spilling milk at every break and its boat like seed pods, laden with precious silk of finest tissue. Is there any weed more difficult to eradicate?

In the garden soil there are layers and layers of weed seeds. Says John Burroughs, "As I uncover the earth in my fields ragweed and pigweed spring up; if these are destroyed, honest grass, quack grass or purslane appears; the spade or plow that turns these under is sure to turn up some other variety as chickweed, sheep sorrel or goose foot. There is a rank growing jimson weed found on almost every vacant lot. These and many others threaten our garden kingdom. The best and safest remedy against weeds is frequent cultivation.

Our garden intimately related to us personally presents quite a contrast to the teaching about tadpoles one day, milkweed pods another and bees still another, as abstract subjects. The brown beetle that flies about our windows and screen door at night, apparently harmless comes from the grub which eats the tender roots of our garden plants. The bee gathering nectar from the iris, dusting his legs on the pistil of another iris, fertilizes the flower and seeds which can be successfully grown and formed.

The earthworm is a living plow, loosening up the soil as it burrows underground, helps cultivate the garden soil and prepares plant food. These are all intensely interesting because they live in our garden when the growth of our plants demands constant care, cultivation

and warfare against enemies.

-Garden Studies As Correlated with Art,  
Language, Mathematics and Literature, -

Many are the opportunities for correlation in school garden work. The very first essential in easy writing is to have something to say, as original subjects are hard at best. Let the children write about the toad in the garden, the bogworm or the tomato worm. If the child has had no such experience, why not begin by assigning him a living topic. Let him make observations and report in writing. Correlation of gardening with art gives excellent results. The child draws that in which he is intensely interested. The radishes he raised are of great moment to him. These drawings can be further applied in design for book covers and in various other ways.

The child should draw to a scale the entire garden, his own plot or class plot. The depth of planting, the distance apart, distance of rows, number of plants in one foot, one row, more rows, the market value of products and many other problems will present themselves in Mathematics. When the problems are worked out they should state a fact worth knowing.

In the manual work, stakes, labels, rustic baskets, markers, garden benches, bird houses, bird baths and many other useful things are made.

No better work in Geography can be given than the study of erosion.

In the study of gardening there should be a course in English poetry. The poems should be exactly appropriate to the subject and the occasion. Much excellent poetry for Arbor and Bird Day, for spring, winter and the other seasons adapted to the grade..



" A school yard planted by a gardner is good if the work can be done in no other way, but the one that best serves its educational value, is planted by children, no matter how small the ground or how crude the result. It is in such a garden that moral teaching is accomplished."

All grounds can be made more attractive. In fact, such improvement is of prime consideration. It makes the progress of the school in pedagogical ideas.

The school garden should have a special area set aside for it, as any other labratory has. It should be ornamental as well as useful. It should be a good one to do its best work. It is for direct instruction and a capable director should be in charge. It should relate the child's school life to his real life.

#### -Benefits Derived From School Gardening-

Here the children learn some necessary civic virtues; private care of public property, economy, application, concentration, thrift, honesty, justice, industry. They also learn what is morally as well as culturally right in the garden. Lessons like these become gradually ingrained habits of thought and the child fibre is toughened morally. In a word, it makes better citizens of them and if there is one thing more than anything else it is good citizens.

As for sanitation, cleanliness goes hand in hand with the planting of trees and flowers. As for health, gardening expands the the lungs, enlarges the chest, develops the muscles and deepens the breathing.

It has made plants a part of the home as books and pictures are. Not only do they appeal to the owner but to others. It has awakened an



intrinsic interest in natural objects towards conservation. Here the children have come to feel that every plant and animal lives its own life. It has its battles to fight.

The garden is an excellent place to learn the difference between true and false economy. Actual money is not the only thing that can be spent wastefully in a garden, but also energy, labor, time, seeds, water, air and fertilizer. The proper instruction in school gardening leads to more intelligent use of time and strength in every task in life. Every child needs to be taught how to save time, labor and material in daily tasks. The application is made in all things. The children are taught to think about work, the best way of doing it, and then to make the efficient way a habit.

The children note the difference between the strong, healthy plants grown in the sunlight and the pale delicate ones grown in the shade.

Their attention should be called to the fact that people who work in factories or in the house, to those who seldom go out in the fresh air and sunshine, are usually without the ruddy color of the former or those who spend much time out of doors.

In removing the cover gradually from plants grown in the dark, observe the noxious insects and other pests gathered there. This is another great lesson that much disease and many insect pests thrive in semi darkness. Call the children's attention to the fact that almost all the germs of our serious diseases can be killed by sunlight.