

## PRACTICAL WORK IN BOTANY.

In the summer of 1885 an entirely new plan was adopted by my assistant, Miss Martin, in teaching botany in our high school, and the same idea has been carried out successfully in the lower rooms. Instead of the old, dull recitation of facts, and the analysis of a few flowers, each member of the class of twenty was incited to do personal work. The result was an attainment of much more botanical knowledge, and also a deep love for the study. A brief account of some of the work may incite other teachers to do likewise—drop the book and study nature.

Each pupil was given a small box, in which to plant seeds, and urged to dig up the seeds frequently, in order that he might see the process of germination. Germination was also shown by placing seeds on a strip of muslin tied over a tumbler of water in such a manner that the seeds rested on the water. The former plan seemed to be the most popular, and great sport there was over a peanut that developed into a Lima bean when its leaves appeared.

In studying roots and leaves, the class made drawings of the different shapes, copying from Prang's botanical series of cards, as well as from nature. Almost every fine day excursions were made, and the different leaves and flowers gathered were saved for later analysis or for pressing. A simple vasculum for the carrying of specimens can be made out of a tin can in which beef tongues are sold. If the top is carefully cut off close to the edge the box is nearly complete. Partitions can be made of thin wire, and a cover of a large lard pail will serve as a cover for the vasculum. A little ingenuity is all that is needed. A better one can be made at a trifling cost by any tinsmith, and a good size is twelve inches long, six inches wide, and two and one-half deep. A handle of wire is all that is then needed.

Sometimes a field book is wanted. A simple one can be made by taking the top and bottom of a thick pasteboard box, eighteen inches long, by eight or ten inches wide—the back can be made of stout cloth or leather. The ends and one side should have oil-silk flaps to turn over the paper and prevent specimens from wetting. A shawl strap serves to fasten the book, and as a handle. Common thin blotting-paper will serve for drying paper. This should be cut a trifle smaller than the book.

A simple press can be made of two boards, or slates, about the same size as the field book. Pressure is made by a rope twisted around the middle. In using the press, from fifty to two hundred dryers, according to work done by the pupils, are wanted. These can be made of newspapers or any slightly bibulous paper, and should consist of eight or so thicknesses sewed together, along their sides. Forceps, knives, hatchets, and saws, trowels, and small boxes for carrying moss, are also necessary articles, usually found in every family.

After six weeks of this out-door general work, each member of the class was assigned special work, in accordance with his taste and ability. One was preparing specimens of wood. A large collection of the various woods in this vicinity was made. Each billet was ten inches long, and four inches thick. Pupils were required to do their own sawing from the trees, then to split each piece of wood in two, lengthwise. These billets were seasoned in a warm room—not by the stove, where they would warp—for at least a month, and planed smooth on the ends and inner side. The common and botanical names were written in common black or Indian ink, and the planed surface varnished with white shellac varnish. The gathering of these specimens by the boys and girls revealed to them certain subjects for essays, and thus served as a double lesson. Justice demands that the girls should have the credit of securing specimens from the hardest and toughest trees.

Another division made large collections of leaves of different shapes and veining, which were analyzed and pressed, and a written analysis of each leaf was prepared for the collection. The same was done with the flowers gathered.

Another division of the class mounted specimens

of the epidermis of leaves and of petals, and transverse and longitudinal sections of the stem for the microscope. The plain slide was furnished to the pupils, who first ground the edges, then mounted the specimens in balsam, the cover glass surrounded by a ring of sealing wax, and the common and botanical names of the specimen written on the stick-tag at one end of the slide. This is a very fascinating work, and any teacher who has Manton's "Beginnings with the Microscope" can readily and easily guide pupils in the work. Cases for holding the slides were also made by the pupils.

Starch tests were also tried by several. These tests for starch in roots are made by applying tincture of iodine with a camel's hair brush. If there is much starch present a violet hue will be perceived; if but a little, only a violet tint will appear. Otherwise there is no starch present. Our pupils were required to make a tabulated statement of the names of the plants they had tested, and the comparative amount of starch in each.

The school owns one of Crouch's large microscopes, thus affording an opportunity for microscopic study of pollen of a large number of flowers. Pupils were required to make drawings of the pollen as seen by them under the glass. Under the drawings were written the common and botanical names of the plant, and a description of the colour, shape, and comparative size of the pollen grains. It might be well to state here that no teacher need be discouraged in this work because her pupils have never been taught to draw. A large proportion of our class never tried to draw until they commenced the study of botany, but by perseverance presented some fine work ere the end of the term.

The rest of the class were engaged in making monographs. Each pupil made a careful study of some one plant; then wrote a description of the same, accompanied by a drawing of the entire plant—root, stem, leaves and blossom—and microscopic drawings of a ripe pistil, stigma, and ovary, a ripe anther, a pollen grain, transverse and longitudinal sections of the stem, the epidermis of a leaf and petal. This description included the "habitat" of the plant, kind of root, stem and leaf, time of flowering, complete analysis of the flower, and the manner of reproduction.

As no two pupils were allowed to collect the same specimens of leaves, flowers, or cut similar billets of wood, nearly a full collection of the flora and trees of the vicinity was gathered. Also, as no two pupils made slides of similar objects or drawings of pollen from similar flowers, or monographs of similar plants, a large collection of interesting and instructive work was obtained. In order to stimulate other classes to excel this work of a single term of twelve weeks, an exhibit of the same was made at the county fair.

This term the same plan is being pursued, and it is expected that ere the term closes our local collection will be nearly complete. To-day every student is interested in his botany work, and a love for investigation has also developed itself in the other science classes. Try this plan, fellow teacher; it will give you health from out-door exercise, increase your love for nature and nature's God, develop power of observation and thought in your pupils, and render school life more profitable and pleasant.—*The Teachers' Institute and Practical Teacher.*

## WORRYING.

In these days, when so much is required of those who serve in our public schools, I feel a deep sympathy for teachers who are just beginning. I long to give them one motto which lies at the foundation of success—"Never worry!"

Even those who may be called veterans know that there are days when the ills of school life appear slowly to accumulate, until, as the afternoon draws to a close, it seems as if our tensely strained nerves must snap. We leave our school-rooms with the feeling that all our power is gone, and we are a perfect failure. Of course the most natural way is to go home, and, sitting lonely in our chamber,

morbidity attempt to think our way out of the trouble, and cudgel our already faded brains for plans for the morrow. In nine cases out of ten these plans will be worthless. The only healthful, successful course, in the face of such day-day experience, is to seek the society of some congenial friend, who has no particular interest in our profession; or, if such a friend is not at hand, to read a good story.

At any rate, I would say to young teachers, resolutely put all thoughts of school away for an hour or two. If you cannot wholly succeed in this, you may gain some rest by trying to do so. Then, when you are refreshed, you can approach the subject, and will find that it has lost much of the dark horror with which tired nerves had invested it; and you will be surprised to see how readily a remedy will present itself, and how, lightly, you can begin the morrow's task.

More teachers wear out from the continued tension with which worry holds the mind than by hard work. As the end of the year looks us in the face, a fine opportunity presents itself to the worrying teacher.

Once asked a friend who had been very successful if, when she came to sum up a year's work, she never tortured herself with thoughts of how much she ought to have accomplished. Her reply had always been a sort of tonic for me. She said, "No! when I begin to worry, I immediately put the strength which I should have used in that way into additional hard work, and I find it is less wearing, and pays better. Then I let it all be."

I remember becoming partly discouraged at Normal School, and going to my respected principal for consolation. He said, "What should you think, if I told you that I sometimes look at the magnitude of the work before me, until just such feelings come creeping on?" I expressed the utmost astonishment, but eagerly asked, "Well, what did you do then?" His answer has had about as healthy an effect on my whole life as a bracing northwest wind sometimes has on the physical system. It was this, "I say to myself, 'You fool, you, go to work and do the best you can, and let the rest go.'"

But, in no field of our efforts is it possible to become disheartened as thoroughly as in that of the moral training of our children. No conscientious teacher can fix the standard of what her position demands any lower than this: "It is my business, as far as I have opportunity, to see that my boys and girls make the best men and women they are capable of becoming." Or, using the illustration of that beautiful poem, *Discipline*, "I must try every means to bring the angel out of the marble."

How easy it becomes, with this aim in view, and having for our material the average children of to-day, with heart and brain filled to repletion with all the interests which used to wait for tired years, to feel that we accomplish nothing.

Another inspiration from the same loved principal has sustained me through seventeen years of effort in this line. Said he, addressing me at the beginning of my work, "If now you should labor all your life for the moral good of your scholars, and at the close should only be able to point to one boy who had become a good man through your influence; when he would otherwise have been a curse to this world; would you feel that a single endeavor had been in vain?"

I have always said to myself since, "Surely, honest trying must accomplish so much," and when we look at it with all its far-reaching results, we say it would be a glorious crowning of our work. And in my experience, as the years have gone by and the children have become men and women, many of them dear friends, and have told me of their grief for wrong-doing, and how much more they felt than they would own at the time; and as I have seen them filled with an earnest desire to be true men and women for life's duties, I have been more and more deeply impressed with the precious truth of that beautiful and encouraging passage, "He that goeth forth and weepeth bearing precious seed, shall doubtless come again with rejoicing, bringing his sheaves with him."