

Teachers in general of small high schools may be delighted with the plan of alternation but my limited experience and observation have not made me very enthusiastic in its support. In my school the plan of alternating subjects has thrown sixteen first year pupils, sixteen second year pupils, and one third year pupil together in botany. The difficulty is twofold. The class is too large and the difference in individual ability is too great. Either of these conditions would hinder class progress; combined they demand serious consideration.

The apparatus for science study in the small high school is limited. This school has enough small microscopes for the class but their magnifying power is too low to be of much aid. It has a single large microscope with two objectives but it also is an inferior instrument and one objective must be removed in order to use the other. When you think of a class of thirty-three, getting plant structures first hand by occasional peeps through a single inferior microscope at slides hastily prepared by the teacher himself the impossibility of the task is easily seen.

How much, then, can be done outside of the text? A small class in our state normal schools under the most favorable conditions consider a "field trip" a "lark," and for a large class it is a "big lark." What term would describe it with thirty-three high school pupils one-half of whom are just out of the eighth grade? Needless to say, "field trips" have not been attempted.

Some of the things that appear to be difficulties in the path of one botany class have been frankly stated. The severest criticism is invited and helpful suggestions are earnestly solicited.

ON CREATING AN INTEREST IN BOTANY.

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How far is the teacher warranted in departing from the customary methods of teaching a subject in order to interest his pupils in it? This question has presented itself to me in connection with the recent examination of the work of a friend of mine who is a mild sort of iconoclast when it comes to the teaching of botany. He has somewhere acquired the idea that botany ought to be made interesting as well as instructive and educational to the student and looks upon every pupil that leaves

his courses without an abiding love for botany as an instance where he has not "made good." It is a matter of common knowledge that a class that is interested is much easier to teach than one that is not, and these schemes he is practicing may be prompted by a certain shrewd selfishness, but this phase of the subject does not interest me at present. I wish, now, simply to give an account of some of his operations for making botany easy to "take."

In the course of a year my friend covers the ground usually covered by classes in botany, a half year being devoted to the structure and physiology of flowering plants and a second half to the spore plants and plant relationships. These courses go rather deeply into ecology as well as work with the microscope and would in no sense be called a "smattering course." In this connection he has concluded that the work should be conducted at a rate that will allow the dull pupil to keep within sight of the rest and the course has accordingly been slowed down to his needs. The bright pupils have been taken care of by providing extra work on each topic studied and if this is completed satisfactorily and the regular work is up to an average of eighty-five per cent an extra credit is given. This additional incentive to study has much to do, I think, with the quality of work done by the whole class. I noticed that the pupils did not work with one eye on the work and the other on the clock and that they did not leave with a relieved look as soon as the period was closed. In fact much studying is done voluntarily before and after school and at other spare times.

Great emphasis is put upon the work in laboratory and field for he holds that nothing is so useful as material studied at first hand. The field trips are many and the students collect their own materials. In line with this there is preserved in a small museum an extensive collection of rootstalks, bulbs, tubers, corms, lichens, fungi, mosses, etc., that are available for study when they are not obtainable in a fresh state from the fields. The direction and destination of each field trip is left, as far as possible, to a decision of the class and this may account for the fact that the morning classes often meet him an hour before school and that the later classes frequently lunch in the field and devote part of the noon hour to study. In this way trips to more distant localities can be made.

The work in the laboratory is conducted by means of a series

of outlines that tell the student what to study and how to study it, leaving my friend time to settle for individual pupils the points that appear too knotty for them. These outlines, let it be said, tell the pupils nothing that they can readily discover for themselves while numerous questions to be answered ensures that the material will be carefully studied. The "verification method" is here carefully avoided. To illustrate: if the chloroplasts are being studied, instead of being told to note the rounded green bodies in the cytoplasm lining the walls of the cell, the pupil is told to look for certain structures in the cell and asked their color, shape, position, comparative size, etc.

The notebooks appear to be made for the teacher instead of the public, since they are written in the laboratory before the recitation or study of the text-book has been made. The notebook thus contains simply what the pupil has been able to find out from the material studied and serves to show the teacher whether the laboratory work has been properly understood. My friend insists that the idea that a notebook should contain a summary of everything that the pupil has learned, is out of date. After the written work is finished the reference work is assigned and the recitations held. At these latter periods everything possible is done to correlate and coördinate the whole work of the topic. The notebooks under this method are not as fine as some that I have seen elsewhere, but they serve very clearly to distinguish what the pupil has learned at first hand from what he has had to take on the authority of the books.

My friend still believes in examinations: not the kind that are set far in advance and for which the pupils cram according to their needs. He insists that his pupils must carry their botanical knowledge in their heads and his examinations are set at the most unexpected times. I have known him to postpone an examination when he had cause to believe that the pupils were expecting it. No examination is given immediately after the subject to which it relates is finished. Some days are usually allowed to elapse for the knowledge to clarify and crystallize, as it were. He contends that this method makes ever ready pupils and I confess that the sight of certain records of previous work in which a majority of the pupils had passed examination after examination with good marks and without a moment's preparation was rather convincing. He tells me that beginning pupils, used to the regular days for examinations in other stud-

ies, are at first strongly opposed to the innovation, but later, finding that a well informed student has nothing to fear, they actually look upon such trials as a sort of game in which the winners are determined strictly on their merits. Thus relieved from the cramming for examinations, and uncertain as to when they will happen, they appear to have concluded to put more energy into the study of the materials in the laboratory.

A certain small reward also goes to those who make the best marks. For instance, the seats in the class room are arranged in three rows. Those with the highest marks are seated in the back row, those with the poorest marks in the front row and the others in between. Of course the majority of the questions in class land in the front row, the back row being called upon to answer such questions as are passed by the others. One might think that those in the back row would be inclined to play under these conditions, but the fact that others will try for their places at the next examination acts as a strong deterrent. The mere possession of a back seat is regarded as a distinction not to be carelessly lost.

In a conspicuous place in the laboratory is hung a framed list of the names of those who have made the highest and second highest averages in previous years. I think he said these pupils receive an extra credit for this. In any event, the pupil who steadily holds the highest mark in class for a year seems to deserve it.

I do not know how far other teachers would justify these little schemes to make botany attractive nor whether they would consider him a good teacher who could not hold the attention of the class by the subject matter alone. All I can say is that his pupils do have an interest in botany after they leave his courses. They have a botanical club of their own, make Saturday excursions and hold meetings for the discussion of papers on botanical subjects and in general art like the budding botanists they are.