AN EXPERIMENT IN TEACHING SEX HYGIENE.

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In 1908 I first became interested in the problem of presenting to boys of 13 to 15 years of age the essentials of sex hygiene. Feeling that progress could come only by experimentation, I began in that year the experiments which have resulted in the following method. The method is pursued in connection with our first year course in "Civic Biology." This course is required of all our first year boys and continues for forty weeks, four periods per week. As it differs from the ordinary course in general biology only in the stress it lays on biological processes which are of economic importance, the method developed for the presentation of sex hygiene could be introduced with equal success into any course in general biology.

The biological course is the ideal medium for this work for many reasons. Biological functions are two in the main—Nutrition and Reproduction—and while in most courses more stress is laid upon the explanation of nutrition, it is a simple and natural matter to restore the balance by a little more attention to the other phase. Again, the best method of treating ignorance in sex matters is, to borrow a medical figure, gradual inoculation to the attainment of immunity rather than attempted condensation into one or two talks of the essentials of the process with the attendant danger of stimulating morbid curiosity or inducing mental indigestion. The subject matter, the method of presentation, and the wide opportunity for comparative treatment make a course in biology ideal for securing gradual acquaintance with the desired facts, and the very naturalness of their introduction into such a course removes the feature of self consciousness.

The idea of a biological introduction to the subject is of course, not a new one. Most of those whose suggestions I have consulted, however, recommend an approach to the subject through a study of the evolution of sex—using cryptogamic botany as their medium. I have always felt that such a method forms so indirect an approach and so adroitly conceals its purpose as utterly to defeat its end. The pupil never really grasps the personal, human application, and his power of reasoning from analogy is extremely limited at this stage in his mental growth. At any rate, the solution of my own problem demanded a shorter and more direct method, and while I felt the necessity of developing the subject on broad lines in order to clothe it with its proper dignity and perspective, I felt that the pupil should realize from the first what the problem was which he was investigating.

Another factor that enters into a laboratory experiment with human beings is the necessity of the operator's never carrying the experiment to a stage where it may result in harm to the subject. In an experiment with animals of a lower order we often determine the limits of the experiment by defining first its maxima, then its minima and selecting the mean. With pupils I had to be eternally cautious of arousing morbid curiosity in personal experiment which might not only defeat my purpose but even result in bodily injury. This fact has made progress necessarily slow, and the present method represents the result of successive experiments with four sections of boys of some 200 per section for the development of the method; and confirmatory experiments with three other sections of the same size to establish lines of criticism and improvement. In point of time the experiments cover three school years. The subjects were the boys of my own classes in the New York High School of Commerce.

Finally, I do not present the method as ideal or free from objection, but merely as a record of progress and in the spirit of research.

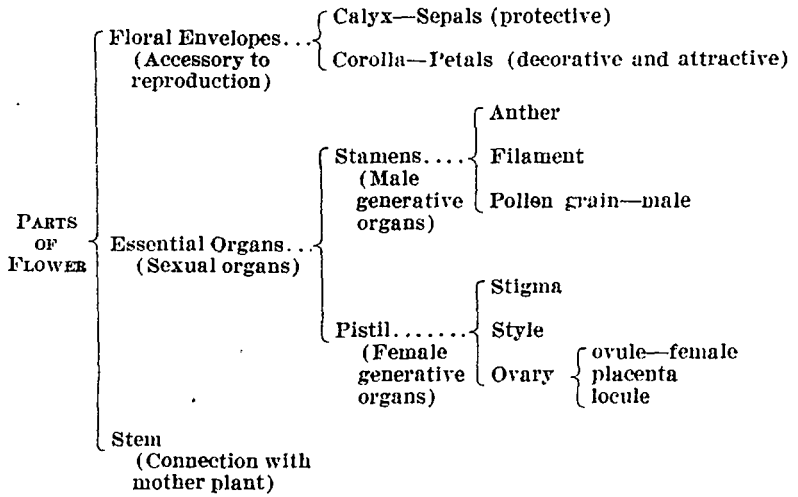
METHOD.

The teaching was associated with four distinct phases of the biological course and was included with other features of such phases.

A. Flower Study.
B. Animal Reproduction.
C. Bacteriology.
D. Human Physiology and Hygiene.

A. *The Flower Study.*

1. By the use of a model I first make clear the location and sexual relationships of the flower parts. The following tabulation aids in this and indicates the parts to which attention is given.



By laboratory dissection of various flowers familiarity is gained with the location and names of the above parts and the meaning of sterile, uni-sexual and bi-sexual learned by comparison of actual types. No stress or time is put upon the study of definitions such as complete, perfect, syngenesious, etc., etc. These terms are of no value except as vocabulary to the student of classification in the use of a manual. They cloud the point of view that I try to make apparent from the start, viz., that we are trying to learn the method of reproduction used by a plant.

2. Use of the parts.

Study of a germinating pollen grain (germinated in syrup) teaches the parts of this organ and the means it employs to

transport its contents. The significance of shape, male nucleus, vegetative nucleus, "stickiness" and dryness are all considered as they are observed.

Study of a bean pod with the same attention to details of observation brings out all the relationships of an ovary. Supplementary microscopic sections show the relation of egg cell and ovule coats to the future seed and embryo. The first idea of mother care is shown by analogy in demonstrating protective wrappings and feeding arrangements.

The study of pollen-bearing insects and the devices used by flowers for the transport of pollen brings out the accessory relations of the floral envelopes to the process. This study also arouses curiosity as to why plants are so anxious to transfer this pollen and suggests the idea that cross pollination is in some way a thing to be desired.

3. Fertilization.

Charts and sections make clear the machinery and process of bringing the male nucleus in contact with the female nucleus, and the curiosity aroused as to pollination is answered in seeing the effects produced by the fusion of the male and female elements, causing the latter to develop into the baby plant.

At this stage the following points are clear:

(a) The universal form of flowering plant reproductive organs and the language used to describe them.

(b) The necessity of getting the male element in contact with the female.

(c) The stress plants lay on cross as distinct from self-fertilization.

(d) The machinery of getting the nuclei in contact.

(e) The dynamic results of the stimulus thus applied to the egg cell in producing cell division and growth to baby plant.

(f) The meaning of maternity in terms of protection and nursing.

4. Heredity and hybridization.

At this point general discussions and review of experiences develop

(a) The meaning of heredity and hereditary "characters."

(b) The part that must be played by nuclei in transmitting these characters.

(N. B. I do not of course go into details of chromosome division with pupils of this age, but simply show by elimination that the nuclei are the only media through which a baby plant can obtain the characters of its parents.)

(c) The significance of hybrids and hybridization and the commercial and economic value of such knowledge to man in breeding.

(d) The danger of not securing variation and response to changed environments when cross pollination is prevented.

The lack of suitable texts in all this work I have overcome by summarizing on mimeograph sheets the points I develop in a recitation period and giving these out *at the close* of the recitation for study and review. This method is, I believe, better than any text, as it prevents reading ahead, and allows an inductive development of each point in logical sequence.

5. Plant Breeding.

A study of the methods in use by plant breeders now follows, and the rôle of such factors as heredity, hybridization, variation and selection in the process is developed in the same manner as the points in 4. Such discussion invariably brings out comparisons with animal breeding methods and paves the way for the division B of our method. It also gives an ideal opportunity for the discussion of natural selection and evolution.

B. *Animal Reproduction.*

Quite apart from the study of zoology in general I have found it wise to bring in at this point a study of animal reproduction, and the use of the fish and fish hatchery methods permits the development of the following topics and comparisons:

1. Fish and Fish Hatchery.

(a) The location by dissection of spermaries and the production of milt.

(b) In similar manner the location of ovaries and the production of roe or eggs.

(c) The law of uni-sexuality in fishes.

(d) The composition of milt and the character of the mixture of sperms and nutritive material.

(e) The parts of a sperm and comparison with a pollen grain.

(f) The parts of an egg and its food supply. Comparison at this point with hen's egg and ovule.

(g) The machinery of bringing sperm and egg in contact used first by the fish hatcher and second by the fish itself. The relation of this process to pollination, fertilization and development.

(h) The low maternal interest in this process and its wastefulness.

2. Development of an Animal Egg.

Study of developing frog's eggs in the laboratory to see process of cell divisions and differentiation. Models help this phase of work.

3. Evolution of Maternity.

A study of the evolution of maternity and the reduction of eggs necessary to secure perpetuation of species makes an ideal introduction to the consideration of the various changes in reproductive processes exhibited by the higher vertebrates. In the light of economy viviparousness and oviparousness are easily compared and the necessity and the significance of copulation are easily discussed and elucidated.

4. Animal Breeding.

Review of plant methods and extension to animals is obviously simple at this stage. Charts showing human sex elements are also shown at this point and the relation of semen to milt made clear.

C. *Bacteriology.*

This subject is introduced here to show a simple process of reproduction, but in the main to teach the relation of bacteria to the production of disease. The method of presentment follows:

1. The preparation of Petri dish cultures and test tube cultures and culture media with the food idea prominent.

2. Exposure of these preparations to various sources such as tooth scrapings, nail parings, air, hairs, coins, pencil points, drinking cup edges, milk, water, etc., etc., ad lib.

3. Incubation and laws of conditions favorable and unfavorable to growth shown by experiment.

4. Studies of colonies in gross and in smears (alive and stained) on slides.

Having learned by direct experimentation to recognize the appearance, structure, and conditions favorable and unfavorable to growth, the discussion of effects, and especially disease effects, follows. The points considered are:

(a) Demonstration of typhoid, tubercular, diphtheria, etc., forms with the microscope.

(b) Preventive measures and sources of infection involving explanation of antiseptics, disinfectants, preventive measures to secure uncontaminated food and drinking supplies, toxins and antitoxins, value of personal and civic cleanliness, etc., etc.

D. *Human Physiology and Hygiene.*

In this work the points applied are:

1. A study of the disorders of the mouth, nose, teeth and throat and the need of care to prevent infection.

2. In connection with digestion the intestinal disorders and the relation of constipation and diarrhœa to the same bacterial influence.

3. Value of pure food in connection with discussions of nutrients and food selection. Danger of drinking cups.

4. Care of skin and bathing.

5. Dust and its relation to tuberculosis and diphtheria.

It is then a simple matter to allude to the peculiar proneness of the sexual organs to infection and the consequences of abuse or infection through ignorance.

Comment.

The above method proves with my pupils a logical, simple and interesting process of enlightenment. Its development results in a frank expression of views and inquiry with as little self-consciousness as one finds in a body of scientists when discussing a so-called "delicate subject." I attribute a large part of this result to the vocabulary the child gains which enables him to clothe his inquiries in forms that do not embarrass him. Morbid curiosity never apparently develops, due probably to the fact that the question is answered almost as fast as it is formulated. The "snicker," "side glance of conscious entering on forbidden ground" seldom appear now, and as a matter of fact I have long since ceased to fear these. As a rule they mark a half knowledge which when it is fully en-

lightened removes the impulse which generated these self-conscious expressions. The increasing frankness of discussion as the days go by destroys all these false-modesty ideas of the ignorant boy.

I must warn the teacher who tries this method, however, that it is as necessary to watch himself as to watch the boy. Diffidence, self-consciousness on his part or the least indication that he feels the subject indelicate will ruin all his results. I have found that I can now talk calmly and easily with the boys on subjects that at first I slurred over for fear of showing this sense of indelicacy. Such a sense is our heredity birth-right, and in this case we must sell it as fast as possible.

I also wish to state that although the above method has been tried by a man with boys, I see no reason why a similar course with certain obvious modifications could not be taught by a woman to girls. I do not believe in the desirability of teaching sex hygiene to mixed classes of boys and girls. The conditions of the experiment are too difficult.

I may add, finally, that the same general plan of presentment developed in lecture form for those who have no opportunity to take a biological course works out well in the cases I have personally tried, viz., with certain private school boys. I do not recommend this plan, however, when it is possible to combine the teaching with biology.