

THE BIOLOGY TEACHER AND SEX EDUCATION<sup>1</sup>

BY BENJAMIN C. GRUENBERG

*Assistant Director of Educational Work, United States Public Health Service.*

One of the first demands that a community will make upon the teachers of special subjects is that they apply the principles of their subjects to their everyday problems, i. e., the boys and girls they have to teach. The teacher of biology, for example, must be expected not only to know the principles of ventilation, of fatigue, of the relation of exercise to digestion, of the relation of postural tensions of the skeletal muscles to the action of the viscera and to mental states; such a teacher must not only teach these principles to his students—he must make sure that the best working and living conditions for boys and girls are obtained as indicated by these principles.

We are not directly responsible for all of the difficulties and problems with which the boys and girls come to us in high school. We are not responsible, for example, for the fact that most children are neglected during the early years with respect to enlightenment on sex matters so that our introduction to the subject of sex comes on the average five years too late. We are not responsible for conditions in the homes and in the community at large that operate against the best interest of the children both from the viewpoint of physical health and from the viewpoint of mental health. But we are responsible for knowing what the conditions in the homes and in the community are, and we are responsible for adjusting our instruction and our guidance to meet the discoverable needs of the children, no matter what other community agencies do or fail to do. We must understand our social environment as well as our special subject if our teaching is to serve to its full capacity.

From the viewpoint of harmonizing his internal impulses with the demands and the limitations of his physical and social environment, the adolescent makes many diverse claims upon his "education." He needs first a daily program of activities that will make constructive use of his undirected energies; that will release the strains set up as a result of the internal secretions of the gonads and other physiological changes; and that will habituate him to socially acceptable modes of conduct. He may demand vital contacts with inspiring personalities and ideals

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that will serve both to determine the form which his ideals and aspirations will take, and to strengthen his purposes and resolutions in meeting his problems day by day. He needs, further, guidance in interpreting the world about him as it operates through human passions, frictions and institutions. He is entitled, finally, to a common-sense acquaintance with the significant facts of life.

If other specialized teachers in the high school are to aid pupils in the interpretation of human relations—through literature, history, social studies—we must insure for them a foundation of knowledge on the part of the pupil which comes properly out of the biological studies. This is necessary if the discussions of these other teachers and their indirect allusions, in which so much of moral or social instruction consists, are to be of genuine value to the boys and girls. Whether our teaching is according to the type method, according to physiological problems, according to ecological or economic principles, the facts of sex cannot be escaped except by deliberate and violent distortion of our material. The teaching of morphology is impossible without taking into account reproductive structures and processes, whether in plants or in animals. A study organized about processes and functions which disregards those functions and processes that have to do directly or indirectly with the facts of reproduction is so obviously a fraud that even high school boys and girls are aware of the omission and frequently comment upon it. In the study of the relation between organism and environment there is nothing more striking or more significant than the adaptations for the perpetuation of the species as distinguished from adaptations for the survival of the individual. In the application of biological principles to economic problems both the structures and the processes related to reproduction come to be of prime interest. Even in the purely dilettante study of plants or animals for their esthetic possibilities, the flowers and other reproductive bodies, the distinctive plumage of birds and other secondary sexual characters acquire an outstanding interest.

The sequence in which various topics are taught is of minor importance. If we are teaching about organisms and if our teaching is organic, we find ourselves constantly repeating "topics" that have previously been studied in order to integrate each new idea with all that has gone before. No matter where we begin, sooner or later we must contemplate the organism

as a whole and the world of life as a whole. Somewhere in the course, therefore, each of the following topics should be touched upon, its implications made clear, its relations to other aspects of life established without ambiguity.

1. Development. The organism as we know it results from successive cell divisions with differentiation.

2. Origins. The single cell out of which the organism develops, originates from general vegetative cells or from specialized reproductive cells; and a reproductive cell may be sexual or asexual.

3. The universality of sex. In plants and in animals at every level of evolution sex is found. Moreover, the process of reproduction must be assimilated to the other processes and properties of protoplasm.

4. Parenthood and infancy. The transition from the externally fertilized and abandoned egg of lower forms to the internally fertilized and elaborately served and protected egg of mammalia, including man, and spermatophyta; the status of offspring after birth in the higher reaches.

5. Embryology. The outstanding features in the development of a vertebrate such as the frog or fish, with some reference to the analogous processes in the mammal. This is not so much to stress unduly the so-called law of recapitulation as to familiarize the pupils with the principles of development by progressive differentiation, and of the relationship between foetus and parent. The latter is especially important for counteracting widely prevalent and pernicious superstitions regarding "maternal impressions" and related aberrations.

6. Glands and gonads. The concept *gland* should be fairly clear from physiological principles studied; and the concept *gonad* should be clear from the study of reproduction, especially sexual reproduction and the origin of gametes. There is frequently confusion, however, when the attempt is made to teach internal secretions with special reference to the interstitial secretions of the gonads because the gonads themselves are frequently spoken of as "sexual glands." Strictly speaking of course the gonads are not glands since the products which they discharge are formed bodies (the gametes) rather than specific fluids. This confusion is serious because it leads in a large number of cases to identifying the spermatic fluid, for example, with the "internal secretions" with the result that the discharge of seminal fluid comes to be associated with "loss of manhood," and so adds unneces-

sarily to the anxieties of boys when they already have troubles enough.

The relationships between the internal secretions, of the gonads as well as of other organs, and the development of structural and functional characteristics, first, of the species as a whole (as certain intellectual and emotional qualities), and second, of the male or the female are both interesting and important. A study of these relationships can be made to impress upon the students a certain regard, not to say reverence, for these distinctive manifestations of our highly evolved species and of the highly differentiated sexes. The remarkable results of accidental, pathological or experimental castrations, and the results of the transplantation of gonads and of other endocrine organs and tissues have become an integral part of biological science as well as an indispensable part of applied biology and should by no means be omitted from the course simply because the usual text book or syllabus fails to mention them.

7. Secondary sexual characters. Their presence in both plants and animals and the great variety of forms which they assume in different types; the probable sources of secondary sexual characters in physiological changes, as distinguished from their possible adaptive significance. This topic is not only of great interest to young people but can be made a source of helpful guidance in the formation of ideals. In the course of the feminist movement it had come to seem necessary to emphasize the similarities between male and female in order to counteract the traditional emphasis on differences. But with the suffrage assured and with economic and social opportunities thrown wide open, it becomes profitable to re-examine the basic differences with a view to discovering significant possibilities for specialization. Having eliminated the invidious implications of earlier emphasis upon differences, it is now possible to draw attention to the positive, constructive forms of expression involved in these differences. It is just as true to say that girls can do things which boys cannot do as well, as to say that boys can do things which girls cannot do as well. It is recognized in education that we must help find for each individual that which he can do distinctively; we must also find what each sex can do most profitably. Moreover, a study of the secondary sexual characters lends itself very readily to the development of the idea that the higher organisms have available energies in excess of what is necessary for the maintenance of life. These energies find

outlet in structures and activities of a kind that distinguish each species from all others, and they are energies available in human beings for the highest types of activity that characterize the species. Our fine arts and our practical arts, our sciences and philosophies, can be shown to arise in considerable measure from these surplus energies made available by the internal secretions.

The subject of the secondary sexual characters, closely related to that of internal secretions, presents difficulties to teachers chiefly because we have not accustomed ourselves to thinking of the intimate interrelations within the organisms. In our own training the emphasis had been laid too much upon external adaptations in the Darwinian sense and in many cases in a teleological sense. But the simpler physiological process which we are already teaching can lead up very satisfactorily to these newer ideas. We know that chemical changes modify the action of protoplasm in a very striking way—as, for example, the increase in pulse rate resulting from a brief period of vigorous physical exercise. This familiar phenomenon is sometimes “explained” by saying that increased activity creates a demand for more oxygen in the tissues and that *therefore* the respiration and pulse rate are increased. When we come to think of this we see that the explanation obviously puts the cart before the horse. What really happens is that the increased activity results in the liberation into the blood of increasing amounts of carbon dioxide; and that the partial pressure of the carbon dioxide in the blood affects the nerves in the heart controlling the pulse rate and the respiration rate. In the same way our other studies have shown the effects of poisons, stimulants and narcotics as modifiers of feeling and behavior. It should not then be difficult to grasp the idea that certain specific bodies produce distinct modifications in the behavior of the various tissues and organs of the body even though these specific bodies are derived from the organism itself.

8. How we learn. The response of organisms to specific stimuli or to situations as a whole, and the processes by which the response is modified. Pavlov's experiments with the secretions of saliva and gastric juices in the dog furnish an excellent introduction to the study of conditioned reflexes, and this concept may be developed as a solid foundation for understanding how we came to substitute groups of stimuli, artificially or arbitrarily assembled, for the basic stimuli that naturally bring about a

given response. We can learn to have the mouth water on sound of the dinner bell. We can learn to straighten up when the word "posture" is mentioned. The importance of this study lies in two directions: It gives the student an understanding of the mechanism through which he may acquire that very much desired "self control" which he is constantly exhorted to exercise without being told how; and it gives him a better understanding of what we sometimes call "human nature" which he will need in adjusting himself to others and especially in his subsequent efforts to guide others, for example, his own children, in the formation of desirable habits. It goes without saying that an understanding of this mechanism is essential for the teacher.

9. Heredity and environment. Wherever the opportunity presents itself, students will invariably bring up the question of heredity and environment. With the basis of information concerning the various functions of the organism a study of fluctuations and modifications becomes possible. The Mendelian principles of segregation and unit character as shown in the phenomena of dominance, the idea of multiple factors, and that of the continuity of germ plasm are easily taught toward the end of the biology course even in the first year of high school.

In our inveterate disposition to preach we are often tempted to make of the study of heredity an occasion for impressing upon our students the responsibility of parenthood and to do so in a way that flatly contradicts our scientific teaching. On the one hand we teach the persistence of germinal factors that determine capacity; on the other hand we try to insinuate that the righteous life will insure superior progeny. This is, of course, sheer nonsense. What we may say is that those who have capacity for high grade living have it because of their heredity and manifest it because of their opportunities; and that they in turn will transmit such capacities to their offspring whether they have themselves manifested them or not. The most valuable implications, it seems to me, that the study of heredity carries for young people, is in the direction of opening the eyes to fundamental organic values, a cultivating, so to speak, of taste in organisms. We may perhaps teach young people to think of their future mates as the parents of their own children more critically than they might otherwise do.

Hand in hand with the study of heredity goes the inevitable question of the relative importance of heredity and environment. As usually formulated this question has, strictly speaking, no

real meaning. Two eggs in an incubator exposed to identical environment will yield respectively a Plymouth Rock and a White Leghorn. In both cases the unfolding of inherent characters depends upon a particular environment; a different environment would have inhibited the development of some capacities—would have stimulated the development of others. When we come to human beings our study of biology should make clear that there are certain fundamental conditions for normal development and that departures from or additions to these essentials of the environment modify development of the total inherent capacity in a way that is peculiar to each individual. There is no environment that is the best environment for all although there are certain things which every organism, more particularly every human being, must have in its environment if it is to develop favorably.

10. Venereal diseases. When we are teaching the elements of infectious diseases, gonorrhea and syphilis with their more pronounced symptoms and consequences may be taught along with tuberculosis and diphtheria and typhoid fever, etc. After the principles of reproduction have been taught, the venereal diseases as such, that is to say in their relation to the most frequent mode of transmission, may again be introduced from the viewpoint of prevention and from the viewpoint of their more serious racial consequences.

11. Personal problems. Varying with the composition of the class and with the personal relation between pupil and teacher, a multitude of other questions will arise that have a proper place in biology instruction, although they may not be uniformly part of the biology course. Among these questions are the facts and meaning of menstruation and seminal emissions; or the problems of so-called "sex necessity" and masturbation. These questions can never be handled satisfactorily in mixed classes of high school age and probably not in classes at all by most teachers. Yet the individual student should certainly have an opportunity to have his questions answered and in many cases the biology teacher is the only one equipped to meet the situation and will, therefore, have to find opportunity outside of class.

In the teaching of science we must be confident that the truth needs no bolstering. There is need for neither exaggeration nor minimizing of statistical data or of clinical facts. The pushing of a moral with too much vehemence is likely not only to arouse hostility of pupils, but also to arouse suspicions as to

the validity of the argument. The scientific temper means not only that we make pupils consider all facts without prejudice, but that we as teachers be always ready to consider new facts and new interpretations of old facts. We ask our pupils to be open-minded and objective; if, instead of asking them, we demonstrate these attitudes day by day for a reasonable length of time, we shall be spared the need of asking them, and probably get better results. We must realize that the value of science—or knowledge—is not in making us do things, but in showing us an ever better way of doing what we already wish to do, and better things to desire. Its great intellectual contribution is in making its followers hold fast to what they have, always subject to revision—in giving us the experimental outlook upon the problems of life—in habituating us to accept truth as always tentative, a working hypothesis, and our beliefs as constantly growing and refining, not as final doctrines to be forced upon all who come under our domination.

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#### CONTESTS TEACH CHILDREN SAFETY.

Reduction of automobile accidents and fatalities among school children already are beginning to be apparent as a result of the national safety contests conducted by the Highway and Highway Transport Education Committee, according to reports emanating from all sections of the country, it was said here today by officials of the committee.

"We observe a decided tendency toward carefulness," writes one school superintendent. "It is unlikely that the principles of safety could have been impressed more firmly upon the minds of our pupils in any other manner than by means of the contest conducted under your supervision."

With the contests over, the next task, according to the committee, is the grading of the manuscripts and the awarding of the 472 state and territorial prizes and the national honors and prizes offered for the best essays and the best lessons prepared in the contests. Correspondence with school officials from all sections of the country indicate that a veritable deluge of essays by pupils and lessons by teachers are reaching the offices of the superintendents and principals.

"We feel keenly the responsibility that devolves upon us to see that each manuscript written receives careful consideration," say officials of the committee. We are receiving splendid cooperation from county, city and state superintendents of schools."

As a result of the campaign conducted by the committee many inquiries are being received regarding the best means of caring for local conditions. These requests come from Tennessee, Michigan, California, and other states. It is believed the committee eventually will become a clearing house for safety ideas, disseminating them to all persons interested in the protection of children from motor mishaps.

It is said that the results of the contests can not be known before March or April. At that time a general announcement will be sent out to all schools and persons interested, and to the press.