ADAPTING CHEMISTRY TO THE NEEDS OF THE CITIZEN

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Today the problems of secondary education are different from those of fifteen or twenty years ago. Statistics show that a class of young people is enrolled in our schools that was absent years ago. In many cases this group represents as much as fifty per cent of our enrollment and is made up of those who, after leaving school, will work mainly in unskilled and semi-skilled jobs. The present high school program offers them very little of practical value. The question is, what are we going to do about it?

To us, as science teachers, this problem offers a real challenge. Undoubtedly the day when the sole duty of the high school was to prepare its graduates for college entrance has passed. If we wish to serve our population in the full manner that a school should serve, curriculum and adjustments must be made. A possible solution is the introduction of consumer courses. Consumer chemistry and consumer physics are relatively new courses, yet many high schools are already attempting to introduce consumer problems in the laboratory work.

Here another problem confronts us. How far are we to go with our consumer problems? Should we make our science courses recreational and descriptive? Should we discontinue stressing those principles which have for years served as fundamentals for further work in science? Consumer work is interesting. It is self-motivating. Our experience has been that the students enjoy it.

This work is valuable in itself—but it can be made still more valuable if it serves a two-fold purpose—the teaching of some specific consumer problem, and coupled with that—the teaching of some fundamental science principle. Rather than speak in generalities I am going to limit myself to chemistry. And since I am best acquainted with our school, Morton High School in Cicero, I am going to speak about our school, our problems, our students, and state in brief what we are doing. Not that we are perfect, but it might serve at least as a beginning for solving the problem of serving the citizen.

Only a small per cent of the four hundred students enrolled in our chemistry courses will ever become chemistry majors, and I am certain that these conditions exist in other schools. As is well known, most text books and manuals are aimed directly at those who intend to major in chemistry. Therefore, in order to try out some of our ideas we have had to select and write our own experiments.

In this program we have endeavored to follow the following procedure: First,

teach a fundamental principle of chemistry. Second, use common materials, those which the average citizen will contact in his post-school life, to illustrate that principle. Third, emphasize a consumer principle that will be beneficial.

In teaching the concepts of matter—elements, compounds, and mixtures—we use as one of our experiments the preparation of a tooth powder. The student tests the individual properties of each of the ingredients, noting and recording which ones will polish, which ones will neutralize acids, which ones have tastes and flavor. After blending all of the materials together to form the mixture, he again tests and notes that the original properties have been retained. In this manner we feel that he has learned the characteristics of a mixture and at the same time something about tooth powder.

The principle of neutralization is certainly one that must receive consideration. We use every day acids and bases such as vinegar and household ammonia to teach this principle. Titration work with standardized solutions are carried out. The student calculates the actual weight of active ingredient present in different commercial brands and finally draws his conclusion as to which is the best buy.

In connection with neutralization we must always consider hydrolysis. What better teaching material can be found than the reactions of the common water softeners? Following the same line of attack used in neutralization we require the student to titrate a standardized soap solution against hard water and hard water which has been softened by different commercial water softeners. Here again a consumer problem is introduced which necessitates the student determining the best money value. It might be interesting to know that the preciseness of results secured by high school students is quite gratifying. Space and time prevent a further detailed discussion, but let me mention that a study of automobile anti-freezes is very effective in teaching the ionization theory. Colloidal chemistry receives a new impetus with the addition of a study of cosmetic creams and lotions. A study of the flash point of gasolines teaches both hydrocarbon and combustion. Under foods, the determination of butter fat in milk and ice cream can be used to illustrate important reactions and their causes. Our own students had their eyes opened to the chocolate drink that is on the market when they discovered the difference in butter fat content between it and chocolate milk. These are only a few examples. The possibilities in this line of attack seem endless. Whether or not this is one solution to our present problem remains to be seen.

Our chemistry curriculum must be changed. But it must not be changed so as to eliminate the fundamental principles which lead to a scientific method of thinking and reasoning. It should not be so depleted of chemistry that the future science major will find nothing that will be beneficial to him. At the present time I know of no better way of doing this than by teaching the standard and time-recognized fundamental principles of chemistry by means of present day practical applications. But if there is a better way, we should all be interested in contacting it, because we must never forget we are here to help all students to better help themselves to become better citizens.