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HOW SHOULD SCIENCE BE TAUGHT TO AID IN OUR PRESENT EMERGENCY

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Our present national emergency in defense and all-out effort of warfare has greatly emphasized the need of men and women thoroughly trained in mathematics and science. There can be no doubt that we live in a highly developed and specialized scientific world. In view of this fact, it is more than ever necessary that citizens understand the basic principles of science involved in their environment. The mathematics and science courses of our secondary schools and colleges if properly taught, can contribute much to the civic and national welfare. I do not wish to be presumptuous in suggesting that there are only certain methods by which science classes may be taught and that your present methods of teaching are entirely wrong. However, I do wish to urge that our science teaching become definitely functional and practical for the students so that they may make use of their science experiences both now and in the future. The content of our science courses should be thoroughly scrutinized with the view of including only the subject matter which is essential to the needs of our students. This may make necessary the elimination of certain material which we have long thought of as essential and the substitution of new material. Also, possibly it means spending a longer period of time on a smaller amount of subject matter in order to insure thoroughness as well as practicality.

I wish to suggest that in the three commonly taught science classes of the high school that more emphasis be placed on participation in learning activities dealing with things vital to the student in relation to his own life and to his community. Such activities should be of greater value than the mere learning and memorizing of facts from textbooks. Those following me on this program are going to discuss certain specific phases concerning individual science subjects. Therefore, I shall confine this discussion, particularly, to general phases of General Science, Biology, and Chemistry.

By far the greater number of students of the secondary schools receive instruction in General Science. Its popularity has steadily increased as a requirement of secondary curricula. There are so many varied subjects in this general field to be considered that it becomes a difficult problem to make the selection of material which is vital. It seems that most certainly an elementary consideration of atomic structure of matter is a necessity since matter is the basic component of our environment. So much of our recent progress in Physical Science has resulted from a better understanding of the nature of matter. This particular phase may not have such intimate connection with the individual student but will be a necessary part of his equipment to understand intelligently modern scientific discoveries and recent articles, even though they are popular articles.

At the present time much emphasis is being placed upon health, nutrition, physical fitness, and in First Aid as matters in which every citizen can not only help himself but serve his country. Such things as active community projects dealing with these problems may be sponsored and engaged in by the students, which will be much greater in value than mere knowledge and learning of certain rules of health. I well realize that this subject matter is not the sole concern of the students of General Science but is also the concern of all students or members of the community and is likewise to be considered in the teaching of Biology, Physical Education, and other subject matter. In fact, well organized school

and community projects built around these interests will serve more in the teaching of the particular materials if students actually are a part of such a program.

Aeronautics and aviation are increasingly important in the consideration of the life of the individual and of the nation. I recently heard a man from the Civil Aeronautics Authority and the Office of Education, at North Central Association meetings urging that we make our students air-minded by our various teaching devices. The study of weather, meteorology, and astronomy, which are ordinarily considered in General Science, are of extreme importance in aviation navigation. Again active participation in projects is far better than mere textbook learning. Of great importance to young men and in many cases to young women is an understanding of the principles of the gasoline engine and the principles of aeronautics. Natural interests can be easily capitalized upon in the teaching of these matters in General Science. Further, in our present mechanical and electrical world a very valuable field of study is that of home mechanics, which is important for both boys and girls.

We should not neglect the study of the conservation of our natural resources in the study of any of our sciences. Particularly at this time with such large demands being placed on our natural resources and a shortage of essential war materials, it is easy to teach and instill the ideas and ideals of conservation of our natural resources. The campaigns for saving various scrap materials have been of great value in teaching conservation if properly used. Such attitudes must not be considered merely as temporary measures but something which is essential for the further development of our national and personal welfares.

In addition to the necessity of the teaching of certain of the above mentioned subjects in Biology there are still other important considerations. Most certainly, conservation of natural resources, health and the teaching of human physiology through First Aid cannot be neglected. Attention should be given to the present through well-planned activities, even such as growing a "Victory Garden"; as teaching the factors which influence plant growth and development. Likewise the care of livestock and pets may well illustrate and be used in the discussion of the fundamental principles of reproduction and nutrition of animals. Likewise there is need for consideration of the laws of heredity by practical activities such as records from pedigreed livestock, tracing ones own ancestors and the social problems concerned with the so-called superior and pure races of the world.

Some have experienced the fear that the teaching of only the practical aspects of biology (or any science) would lead to failure on the part of the teacher to give a thorough course in the subject. (Riddle '42). Possibly we need to realize that it is not the object of secondary science subjects to prepare solely professional scientists. We should not lose sight of the possibility of better teaching of fundamental principles through practical activities and applications. Projects and other participation activities are creating an interest on the part of the students to find out details concerning phenomena. Surely that is better than superimposing the enthusiasm of a teacher and forceful study of principles for the sake of knowledge alone.

Finally, let us consider the teaching of chemistry in our secondary schools. The principles and laws of chemistry have come to play an important role in the everyday activities and lives of all. Nevertheless, it seems that the learning of many symbols,

formulas, equations, and mathematical computations becomes extremely distasteful to the beginning chemistry student. It is true that these, when taught from a pure memory standpoint, become a hard and difficult chore for students to do and it is difficult to create an interest in the work. Here again, possibly we are over-emphasizing the mastery of knowledge which is a part of the equipment needed for a chemist. Such a knowledge is indeed necessary for a successful working basis using chemistry in the field of industry and other pursuits of life having a chemical basis. Usually, young students are deeply interested in the common everyday elements and their properties. Possibly, more attention is needed for a descriptive chemistry rather than a lot of emphasis on theoretical chemistry which the majority of these students will not be able to master or have any need of later in life. Very successfully, many instructors have made use of the testing of consumer products and the preparation of various drugs and cosmetics in high school chemistry classes which have been of definite value to the pupils working with them. At the same time many fundamental chemical principles and laws have been learned. Perhaps we can give a knowledge of the fundamentals ordinarily taught by using these particular terms and symbols in our discussion of the problems and definitely relating them to the interests and activities of the students. The associative powers of the memory will help much in remembering these fundamentals when it can be connected with practical applications. Also, we had best provide for the individual interests and vocational choices and aptitudes of our students by challenging them with a more detailed study of certain principles which they will eagerly master than study from the textbook with certain page to page assignments.

In conclusion, we probably do not need to teach science in a greatly different manner during the time of war than during the time of peace. It is true probably that our present emergency has helped us to emphasize the need of practical applications and securing a more definitely embedded knowledge of scientific principles and fundamentals which may be necessary for the life of the students both at the present and in the future. May we use basic principles and methods of presentation with an active participation of the student in learning activities which will develop a scientific attitude and teach scientific principles!

Army and Navy, 1942. - Various publications especially folder by Navy as to education required for definite branches of service.

Riddle, Oscar, Editor.

