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SUGGESTIONS TO GENERAL SCIENCE TEACHERS IN SERVICE

ESSENTIALLY the first suggestion to general science teachers in service is: Be certain of your subject matter and be acquainted with a broad field from which to gather materials as the need arises. This is possible only as a result of excellent preparation for teaching the subject and of a genuine interest in it.

In connection with the collection of materials, there are hundreds of companies, schools, and state and national departments related to every line of interest, which are willing to send pamphlets, samples, etc., to you if you know *what and where they are.*[1]

With a subject as alive as general science should be, it is imperative that a progressive teacher not only continue enriching his background by reading new books in all fields and keeping informed as to the newest and best textbooks and manuals, but that he be a subscriber to *and reader of* the best of his field's magazines and that he also attend summer schools and extension classes to keep his "ways and means" (Sometimes called "methods") up-to-date.

After materials have been collected, it is necessary to organize them in order to get from them the maximum of aid. It is impossible to go into detail regarding methods of organization here, but any one of a number of plans on the modern "market" is usable. The main thing is to organize materials and plans around the interests of the boys and girls rather than the interests of scientists—to organize them psychologically rather than logically.

In order to teach the pupil—rather than the subject—the teacher must bring science home to him. Instead of teaching it as a body of organized knowledge, laden with words, definitions, or other abstractions, use concrete facts, experiments, demonstrations, and trips as your "Open, Sesame" to his interest. When a child can *see* a thing for himself, he can understand it. The essential technical terms should be reduced to language he can understand. The subject matter should be determined by his capacity, interests, and environment and should be arranged on a seasonal basis in order to facilitate his gathering of material. The social significance of science should be emphasized. Its importance in everyday life, the extraordinary influence it has had on recent human affairs, should be stressed as a means of making the subject live for him.

Where only the minimum of materials and equipment is available, it is well to know how to substitute and manufacture additional things from more ordinary matter. This will be a rare test of your ingenuity.

Always, a general science teacher should keep in mind, along with the scientific attitudes, an open-mindedness, and a desire for growth (since there must be either progress or deterioration in a teacher's work), the aims of general science teaching, the things a general science course should give the boys and girls: an appreciation of the value of science in modern industry and everyday life and enough knowledge of nature and the sciences to give him some control over his ordinary environment.

MARY T. E. CRANE

[1]See suggested names and addresses in *How to Teach General Science,* by Frank.

PHYSICS IN THE RURAL HIGH SCHOOL

AFTER making a statistical study of science courses offered in the rural high schools of Virginia it has been found that physics is offered in fewer of the schools than any other science. This is due in part to the opinion that physics is less important than general science, biology, and chemistry, and does not warrant the

expense of equipment necessary to teach it. Another influence operating in the same direction is the recommendations made a few years ago by a conference of college teachers of physics. They recommended that high school science be confined to general science, biology, and chemistry. This recommendation, if carried out, would mean that the studying of physics would be limited practically to students in college.

Rusk[1] says, "Physics stands in an unique position as the fundamental physical science." It is mainly an explanation of common things and it deals with the varied phenomena of the natural world about us, from the simplest everyday experience to those which are more remote from direct situations. In summary, physics is important because it explains the physical basis of the universe. Physics relates to the pupil's environment and to the home. In the home, the lighting and heating, farm implements, the telephone, washing and ironing, and the automobile are all evidences of the application of physics to increased comfort and increased activity.

The possibilities for correlation with home life are more evident in the rural high schools than in the city schools. In choosing the experiments and projects through which the important principles of physics are to be approached, the leading criterion for selection should be the closeness of the project to the pupil's immediate interests and environment in the home and community. For it is a fact that various physical appliances and the natural phenomena of the farm, being constantly before the eyes of the pupils, are pressing for explanations in terms of physical laws.

The expense of equipping a high school physics laboratory is a vital question and is often the rock on which the proposal to offer physics is wrecked. In this connection it is interesting to see how much money has been invested in apparatus by the 71 county schools which give a physics course in Virginia.

[1]Rusk, R. D. *How to Teach Physics*—page 5.

The cost of physics equipment in the 71 county high schools of Virginia for the session 1928-29 ranged from $10 to $3,300. The average cost of equipment in these schools which reported physics equipment was $283.42.

The cost of physics equipment in the Virginia city high schools for the session 1928-29 ranged from $600 to $4,120. The average cost of equipment in the twenty city high schools was $1521.

It is true that every school does not have sufficient equipment and funds to have a physics department, but the physics course need not be a failure on this account. Much of the equipment can be made very easily by the students at a small cost. For example, inclined planes do not have to be purchased from an instrument company, but they can be made by simply cutting three or four foot lengths from a six-inch board of pine. Many articles can be bought at the five and ten cent store: marbles (for impact), Cartesian diver, electric wire and lights, batteries, and many toys which are based on physical principles with which students and the general public are unfamiliar. A meter stick, a wooden block, a spring balance and various masses are all that is needed to do experiments on the coefficient of friction, Archimedes principle, density determinations, angle of repose, etc.

A list of equipment for a physics department with cost of each piece of apparatus for the high school may be obtained by referring to the bulletin, Laboratory Equipment for Science Instruction in the High Schools of Virginia, State Board of Education, Richmond, Va.

Science teachers intending to introduce physics into the high schools would do well to consult such modern studies as the Vestal report,[2] and an article by Herriott.[3]

REBECCA BEVERAGE

[2]Report of the Sub-Committee of the Central Assoc. of Science and Mathematics Teachers (1920) on the content of High School Physics. C. L. Vestal, Chairman. *School Science and Mathematics.* XXI, p. 274-279 (March, 1921).

[3]M. E. Herriott, Life Activities and the Physics Curriculum. *School Science and Math.* XXIV, p. 631-4, (June, 1924).