CHEMISTRY PROJECTS AND EXHIBITIONS

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Every Science teacher is in search of methods for arousing interest in his subject and in a subject such as chemistry, the difficulty is even more obvious than in some of the other sciences. The field of chemistry is so broad that one must even at the best give a hasty overview of the subject in a one year High School course.

The method of projects and exhibits has aided greatly in increasing and stimuing interest in the phases of industrial chemistry. Project work will not and never should replace the laboratory and recitation work but it is an important adjunct in getting a student very familiar with certain fields of an ever increasing volume of chemical facts.

It is well known that industries and home processes are becoming more dependent than ever before on chemistry and science. In many instances men and women with no training in chemistry are being required to do certian chemical procedures, such as soften water, test its hardness, its alkalinity, use carbon dioxide recorders, run analysis of flue gases, test for the acidity in cream, and many others. A course in High School Chemistry will aid in many of these and since that is the only chemistry many will ever study, they should get some experience in their class work. Projects give just this needed opportunity.

They impress more forcibly upon the student the tremendous role which chemistry plays in modern, everyday life. A search of magazine articles and advertisements at once shows that they are filled with reference to chemical processes.

Although the method is not new, yet it has met a wonderful reception in the two years it has been in operation at Culver Military Academy.

The chemistry course is taught on the unit basis. The entire year's work is divided up into sixteen units and by a logical grouping it is hoped that the student will not look upon chemistry as a mass of unrelated and disconnected facts. The course begins with a unit on Chemical history, which in turn is followed by a unit on Mass and Energy. Likewise, another unit on Water and its constituents follows. Under this heading we study Oxygen, Hydrogen, Water and their relation to varying types of solution. This might be carried on through all units in the year's course, but we are interested largely in the application of projects to the course of units. Along with each unit is given a selected list of outside readings. The students interested are at liberty to take any of the topics and, after a thorough perusal of material, are allowed to write a paper on the subject. In this way a certain correlation with the English department is obtained for the student soon finds out that competent work involves the best use of principles used in English.

Aside from the topical references to units we plan on completing two large projects a year, one in each semester. The first semester project is an essay which is submitted in the local contest in preparation for the State contest of the American Chemical Society. The students have their choice of six topics. Before any choice is made all students are given a list of the topics and at the end of

Proc. Ind. Acad. Sci. 40: 189-192. (1930) 1931.

a week lists of textbooks which deal with subject material. After an examination of material they are expected to select a topic and hand in the topic to the instructor in charge. This being a boy's military school, their interests center largely on National Defense and although a choice is allowed, nearly all pupils choose the general topic of "The Relation of Chemistry to National Defense." Various phases of chemistry in warfare are studied and written up.

Conferences are arranged so that the weekly progress of the student is noted—for it is always necessary to keep the slower and indifferent people with their shoulder to the wheel. The best essays in the local contest are then sent in to the State contest. One is surprised at some of the excellent ideas contained and the interest that the boys themselves show in writing the essay.

Just about Thanksgiving time the subject of second semester's projects is discussed with each individual. In many schools it is hard to obtain material for projects since many of the industrial concerns do not with any degree of pleasure relish the idea of sending out samples of their products for school use. Here our problem is much more simple for our class of students are usually from a group of people who are interested in industrial developments. Hence it is quite easy for the students to get a complete process and all the samples showing the various steps in the procedure. Where the student has no relative in an industry involving chemistry, he usually is able to obtain the necessary material from his friends here on the campus.

It is made plain that the process should be investigated during the Christmas vacation, the necessary samples collected, and that they should be back here ready to work on as soon as the vacation is over. From then on until the projects are placed on exhibition, the laboratories become a work shop, humming and teeming with industry, as all boys are busy mounting and arranging material.

Each student is required to become thoroughly familiar with the processes involved so that he can write a discussion and present his discussion before the students of his group.

In this manner each student gets an insight into a number of industrial phases of chemistry. The one who developed the project, of course, becomes satiated with the facts and the others hear a discussion presented in a much more vivid method than had they read only a textbook and then vaguely tried to picture the industrial phases of the materials involved.

These projects as they accumulate from year to year will make a ready industrial reference library and with that aim in view, all projects are mounted on a form so that they may become part of a permanent collection. All projects are mounted on beaver board which has been cut to a size that best shows off the material collected. Most of the projects are mounted on board either 3x3 feet or 3x6 feet, and a few were mounted on boards 3x1 foot. However, it is best to keep them on the larger boards for the sake of unity in the exhibit.

The boards are all given two coats of enamel (black preferred) for then they are easy to keep clean when enameled and a similarity of background gives the whole exhibit a more harmonious tone.

As before stated the students are held entirely responsible for their own projects and their development. However, care must be taken to see that they do not duplicate or overlap each other. Interest is stimulated in the projects by giving points on the semester grade for early completion, best mounting, neatest work, and originality in selection and collecting materials.

Some pupils prefer to take a field which is entirely new to them and develop that. If such cases are found, it is well to encourage them for it gives the student

a broader outlook and I find that in most cases the pupil does more intensive study and research in a new field than in a field where the general principles of the project are already known to him. It is to such people that the Science teacher turns for inspiration to carry on a rather heavy and sometimes exceedingly heavy schedule.

The values of the project method are manifold, but aside from the actual value to the student, two important results are known. In the first place it advertises the classroom and laboratory work. The parents have a right to know what the pupil is doing in his work and the projects and exhibitions afford such a means of direct communication. Then in the second place it interests the pupils of the lower classes for they can see that varying projects explain some problems about which they have been thinking. What is greater for a teacher's ideal than to create character and stimulate and broaden students so that they shall become better men and women and broader intellectual citizens?

As a guide for those who wish to carry out a somewhat similar plan of projects, I am adding a list of projects which have been completed here in the past two years. None of these are duplicates and where the subjects are similar, it means that various phases of the subject have been taken up. For example, in petroleum, one boy went into the methods of distilling crude petroleum, another the hydrocarbons from the "cracking" methods, while still another showed the wax distillate and all its subordinate products.

The projects showing the chemical composition of foods, soaps, cosmetics, and cereals always are of interest to the housewife for they gain an insight into a phase of chemistry that they would probably never think of unless brought directly in contact with it.

CHEMICAL PROJECTS

Paper Making—Sulphite Process, Soda Process, Rag Process. Condensed Hydrocarbons from city gas lines. Soap and Soap Powders (their composition). Zalmite (Imitation Wood). Rubber Flooring (Stedman Process). Bendix Drive. Gypsum Products. Sulphur Products. Glass—Its Constituents—Colored Glassware. Coal Tar Products. Iron and Steel—A grab bar. Coal Tar Dyes. Corn Waste Products. Petroleum—Viscosity factors. Salt Products. Cotton Seed Products. Corn Products. Missouri Meerschaums. Cement Manufacture. Lacquers. Soap Manufacture. Cereals (Their Chemical Composition). Electric Furnace Products—Carborundum. Asphalt Roofing Materials. Aluminum Products. Cosmetics (Their Composition). Electric Furnace Products—Alundum. Wool Products. Foods (Their Composition). Cocoa Products. Micarta. Chemical Compounds (Their Composition). Glass—Its Constituents—Lead Glass. Photographic Film. Chemistry of Flour. Petroleum Products—Wax Products. Duco—Its Evolution. Cane Sugar Manufacture. Dyes—Silk, Cotton, Wool. Linoleum. Wood Creosote. Alloys. Carbon and Nitrogen Cycles. Story of Steel. Distribution of Chemicals in Industrial Processes. Benzene Derivatives. Nuts and Bolts. Asbestos. Rubber. Chart of Rubber Processes. Gasoline Plant Flow Sheet. Youghioheny Gas Coal. Derivatives of Coal. Coal Fields of the United States. Tar Derivatives. Coal Analysis. Searle Purification Process Petroleum. Batteries. Canfield Petroleum Exhibit. Chemistry in Aviation. Cement Manufacture. Aluminum Processes. Distribution of Heavy Chemicals. Flavors, True and Artificial. Fire Extinguishers. Lead Products. Making of a

Fountain Pen. Derivatives of Coal. Corn Products. Corn—Its Varying Uses. Industrial Fuels. Atomic Structure. Cottonseed Oil Consumption. Products of Calcium Carbide. Application of Chemical Engineering (Principles to Related Industries. Silicate of Soda Tree. Activity in Consuming and Producing Industries. Rayon (Artificial Silk). What Plant Foods Do. Pyrex Glassware—2 Plates. Pottery—Chinaware. Wall and Floor Tile. Cottonseed Oil—Its Uses. Brass Display. Magnesium Alloys. Petroleum Refining. Minerals. Sulphuric Acid Processes. Derivatives of Ethyl Alcohol. Insecticides.