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How Experimental is Chemistry?

Andrew W. Stevenson
University High School

Several elementary schools and junior high schools have particiapted in the program, and more may receive the services of scientists during 1963-64. Many of the scientists are becoming more interested and active in helping with the science programs in the elementary and junior high schools because they believe good science programs at the lower grade levels are essential to a good high school program.

Interested schools or teachers may obtain further information and a brochure by writing to Dr. T. R. Porter, University Schools, State University of Iowa, Iowa City, Iowa 52240.

How Experimental Is Chemistry?

Andrew Stevenson
University High School
State University of Iowa

It is generally felt that chemistry is an experimental science. This is the idea conveyed concerning the general high school chemistry course. The big question is, to what degree the course **is** experimental? It is time to take stock of the situation.

An examination of different traditional laboratory guides shows a collection of experiments for the student to do. These experiments give the procedure in detail. If the student can read and follow the directions to the letter he should be able to get the desired results. To help him along, questions are asked at the end of the experiment about what he should have seen. This type of experiment makes it easy for the student to write up the experiment without having done the experiment. Little understanding is required on the part of the student to obtain the required results. The student essentially gains experience with the use of chemical equipment and observes the results of chemical reactions. As far as concepts are concerned the knowledge gained from the experiment could probably be covered in five or ten minutes of class time.

In an effort to increase the benefit from a laboratory approach, scientists and educators with the financial support of the National Science Foundation developed the new course called the Chemical Bond Approach.* This course is centered around the laboratory experiments. Although the earlier experiments give rather detailed directions, as the course progresses the student is given fewer and fewer directions until he is given only the problem to solve and he has to design his own experiment.

An example of one of these experiments would be the reaction between magnesium and hydrochloric acid. The student is informed that the products of the reaction are magnesium chloride, hydrogen, and heat. He is told, "This reaction can be studied using kinetics, thermochemistry, or both." The problem stated is, "Investigate the reaction of magnesium with varying concentrations of hydrochloric acid." No more is said. Last year in two sections at University High School in Iowa City there were almost as many different experimental set-ups as there were students. Some of the things that were studied were; the change in temperature of the acid while holding the volume of acid and the amount of magnesium ribbon constant, the time required to produce 10 ml. of hydrogen gas, the quantity of gas produced holding the column of acid constant and using an excess of magnesium ribbon, and determining the amount of calories given off during the reaction. The collected data were tabulated and graphed.

*The CBA materials may be obtained from the Webster Publishing Division of the McGraw-Hill Book Co. in Hightstown, N. J.

From his own work and from comparing his results with those of his classmates, the student has developed a good understanding of the reaction.

Other experiments will also give the student valuable experiences. In one experiment the student is given three compounds and is asked to investigate the similarities and differences of their chemical properties. These compounds could be sulfate, nitrate, and carbonate of some metal; the different oxides of lead; or the sulfates of magnesium, calcium, and barium. The student is asked to compare his findings with the periodic table. He has to decide what properties to investigate and how to investigate them. By the nature of the experiment the student can go as far as he is able. This enables the teacher to challenge each student at his own level.

The writer feels that when the student learns how to design an experiment and to solve a problem, he will be better equipped to solve personal problems he will encounter in the future as well as additional problems in science. This course gives the student the opportunity to experiment the way chemists do. Past students often report that the course has been valuable in their science courses which follow. Specifically, students at Universityy High School who have experienced the CBA course in past years report that it has been of considerable value as preparation for the philosophy of PSSC physics and the second level BSCS course. They have experienced chemistry as an experimental science!

Junior Academy of Science Program

Bill Houser of Des Moines Roosevelt who is the IJAS Director of Programs this year reports that preliminary plans for the April 18 meeting of the Iowa Junior Academy of Science are nearing completion. A real effort for the involvement of schools teachers, and students from all ove Iowa is planned. The state meetin is at Luther College in Decorah thi year. Plan now to attend with you students. An active science progra locally needs to be represented i this active science program for sc ence students at the state level.

Program Summary

8-9 a.m. Registration
9-11 a.m. Contributed Papers
Biology, Physics, Chemistry, an Earth Science Sections
11-11:30 a.m. Award Ceremonies
11:30-12:30 a.m. Invited Address— (Outstanding Scientist)
12:30-1:30 p.m. Annual Dinner
1:30-3:30 p.m. Concurrent Sessions
Session A. Science Fair Winner
1. Hawkeye
2. Eastern Iowa
3. Quad Cities
4. Sioux Falls
Session B. Symposium Winners
1. State College of Iowa
2. U. S. Army
3. Future Scientists of Amer ica
Session C. Science Talent Searc Winners
Session D. IJAS Scientific Pape Winners

The Iowa Junior Academy of Science

Frank W. Starr
IJAS Executive Secretary
West Waterloo

The Iowa Junior Academy of Sc ence was organized in 1931 as a gro of 15 high school science clubs of th state to promote and reward stude scientific endeavors. The Junior Aca emy offered the opportunity fo communications between studen and teacher—sponsors from differe localities. In addition, the opportu ity for contact by Junior Acadeм