GENERAL SCIENCE

Safety in Science Projects

Danger in science projects can be eliminated through qualified adult supervision, through understanding of materials used, and by following careful procedures.

By FORREST L. SNAKENBERG

➤ "DANGER: SCHOOL SCIENCE PROJECTS" screams a safety bulletin. Surely, but it might also scream "Danger: Crossing the Intersection of Main and Elm during Rush Hour Traffic" or "Danger: Skateboards." Science projects are safer than either if you abide by the rules.

Of course there is danger, or such a headline could not gain credence. There is danger in every life situation if we are careless and haphazard, inattentive to detail, or misinformed. In the case of science projects, the danger might be illustrated by the adage, "A little learning is a dangerous thing."

A science project is not likely to be successful unless the student understands the materials with which he is working, and danger is virtually eliminated if he does. Thus, the benefits of thorough understanding and careful procedures are dual.

Safe Practice Principles

Although they are seldom mentioned, principles of science lie at the heart of most safe practices. When practical cases involving these principles are carefully selected, understanding of safe practices can implement scientific principles and vice versa. Motivated by their abounding interest in cars, students often learn principles of inertia and highway safety simultaneously. Similarly, the study of diseases leads to an appreciation of sanitation. Knowledge can set the stage for safe experimentation and healthy respect for safety.

Thoughtful investigation of available knowledge before embarking on a new venture is a major component of the scientific process. Scientific attitudes such as curiosity, alertness, observation and respect for accuracy all help the student anticipate hazards and cope with them.

Students currently learn more and sooner than did their parents, so quite often parents find their children working beyond the scope of their own experience. They can and should, however, appraise the general attitude and procedures of their children to their satisfaction, and ascertain that their children are under the supervision and tutelage of an adult known to be qualified in the field of study.

Some general precautions relative to use of plants, animals and chemicals follow. In every case, characteristics of the materials used should be researched thoroughly through use of textbooks and library resources in advance of actual experimentation, and qualified adults should be consulted.

There are more than 60 varieties of plants in the United States which may cause irritation to the skin. Most people are immune to the effects of the majority of these plants, but nearly everyone is subject to poison ivy, poison oak and poison sumac. Avoid experimenting with these varieties.

Should another type of plant prove to be irritating, wash the skin with soap and water, and this may be followed by sponging with alcohol. If the irritation is serious, by all means contact a physician and avoid further contact with the offending plant species.

Safety With Animals

Either obtain young animals, or those accustomed to handling. Animals should be handled sufficiently so they will understand the handling as normal, remaining docile. Animals which are teased or handled abruptly may become frightened, resulting in bites or scratches.

Scratches or cuts caused by animals can be especially dangerous and should be treated immediately with iodine or some other good antiseptic. Some diseases carried by animals can be transmitted through cuts or scratches, so anyone with such wounds should not handle animals.

Rats, rabbits, hamsters and mice are best picked up by the scruff of the neck, but hamsters and mice may also be gathered up in the hand if trained in this manner from the beginning.

Animal mothers defend their young fiercely. If the young are to be handled, the mother should be removed so she will not see her young being touched by anyone. Gentleness and knowledge of proper handling by everyone concerned is the safest method.

Unless children are thoroughly familiar with proper handling methods, they should not be left unattended with animals. Fingers should never be pushed through the wire mesh of a cage, because most animals will nibble or bite out of curiosity even if they are not annoyed.

Of the 132 species of snakes found in the 50 states, only 19 are poisonous. Choose one of the non-poisonous varieties for experimentation. Be certain of your identification. The poisonous snakes are classified into four groups — rattlesnakes, copperheads, water moccasins and coral snakes. Victims of snake bite should act promptly, but surely and calmly. A physician should be called immediately while the victim remains as quiet as possible. Here, again, safety can be maintaned by knowledge. Know your snakes are non-poisonous, do not just "think" so. It is not only safe but scientific.

First and foremost is proper storage of chemicals. If experimentation is conducted in the home, the materials should be stored under lock and key if small children are present. A special four-year study made by the New York City Poison Control Center shows that in nearly half of all poisonings the victims were under four years of age. This suggests that adult carelessness is the real culprit.

Fremont Davis

SAFE EQUIPMENT HANDLING— ***Inserting glass tubing through a stopper need not be hazardous. Lubricate the tubing for easier insertion, and wrap the tubing to prevent injury in case breakage does occur.***

Laboratory conditions should equal the safety standards of industry, with safety being practiced as an integral part of the scientific approach.

A few common sense rules should be followed at all times. These are:

1. Experiments without purpose should not be undertaken. Qualified adults should approve not only the project but the materials and methods as well.
2. Proper equipment should be used at all times but only after proper instruction has been given.
3. All materials should be clearly and accurately labeled.
4. First aid remedies should be posted in a conspicuous place for ready reference and should be memorized.
5. Chipped or cracked glassware should be discarded to avoid breakage, especially when heated, resulting in spilled contents.
6. Wear goggles, rubber gloves and rubber aprons in the chemical laboratory, as appropriate, when working with possible skin irritants.
7. Assure proper ventilation of working areas, especially when working with materials which might give off vapors.
8. Use a safety shield between the worker and the materials when working with potentially explosive or flammable chemicals.
9. Keep a fire extinguisher, approved by the Underwriters' or Factory Mutual Lab-

oratories, in a conspicuous place. Test it regularly, recharging if necessary, to assure proper functioning at all times.

10. When inserting glass tubing into a stopper, lubricate the tubing and wrap the tubing in cloth to help prevent injury in event of breakage.

11. Cleanliness of work area and materials is essential.

12 Lab equipment should be constructed of fire-resistant materials.

13. A well-stocked first aid kit is essential in the home laboratory. Know the location of your school's first aid station.

Thirteen common sense rules are "unlucky" only if they are not followed religiously.

Home chemistry sets often are a youngster's first introduction to science. These contain comparatively harmless chemicals, and the accompanying manual usually gives complete directions for numerious experiments using only the materials provided. If directions are followed, no danger is likely. It is the parents' responsibility to aid their children in the proper use of such a chemistry set. Even without a chemical background, parents can review the safety instructions in the manual and make certain their children clearly understand and follow the safety rules.

Most children interested enough in science to perform experiments and work on science projects probably belong to a science club or are taking a science course in school. Teachers and science club sponsors should show safety films and review safety precautions in class or club meetings.

Three suggested films are "Safety in the Chemical Laboratory," a 16mm sound-color 20-minute film available from the Manufacturing Chemists Association, 1825 Connecticut Avenue, N.W., Washington, D.C. 20009; "Safety in the Chemical Lab," also a 16mm sound-color film, available through the Safety Officer, National Institutes of Health, Bethesda, Md.; and "Take Your Choice," a 15-minute film available through the Detroit Society for the Prevention of Blindness, 1401 Ash St., Detroit 8, Mich.

Safety is an integral part of the scientific attitude. Without the scientific attitude, you should not be experimenting. Danger can be avoided, minimized, eliminated. It should never be ignored.

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GENERAL SCIENCE

China's Science Growing

➤ RED CHINA has been strengthening its scientific and engineering muscles by pushing thousands of students through colleges and universities.

Yet these masses of young scientists are getting less comprehensive training than older generations of scientists, according to a 588-page report on scientific and engineering manpower in Communist China from 1949 to 1963. The young scientists also lack sufficient experience to engage in top-level research, states Dr. Chu-yuan Cheng, formerly with the Institute of Far Eastern Studies at Seton Hall University and now with the University of Michigan.

Since the Red Chinese Government has not issued any major statistical reports or communiques since 1960, Dr. Cheng has based much of his investigation on hundreds of newspapers, periodicals and scientific journals published on the Chinese mainland, as well as on a number of Russian and Japanese publications.

In 1963, many of China's leading scientists were 60 or 70 years old, engaged in basic and creative research. Now with China's desire to become a leading world scientific power, quality has been sacrificed for quantity.

The success or failure in bridging the gap between the mass of young scientists and the older scientists will determine whether China will become a scientifically advanced power in the next decade or two, believes Dr. Cheng, who has been conducting the Chinese studies with a grant from the National Science Foundation.

Since the beginning of the Communist regime in 1949, China has also been mobilizing its women into scientific and engineering fields. Enrollment of women students has expanded fivefold in institutions of higher education where thousands of these women are studying science and engineering.

China has also stepped up her participation in new branches of science since 1949. The country entered the nuclear age with Soviet assistance in 1958 with the installation of a 7,000 to 10,000 kilowatt heavy-water-type experimental reactor, a 25-million electron-volt cyclotron and more than 10 types of accelerators. With its successful nuclear explosions of October 1964 and May 1965, Communist China ranks among the countries holding nuclear capability, marking a new era in Chinese science and technology. Research is strongly concentrated in fields where immediate production was possible—in radioelectronics, in meteorology, and in chemical, steel, and other metallurgical industries.

The full use of China's potential scientific and engineering manpower has been hampered by the subordination of scientific training to political dogmatism, states Dr. Cheng. It has also been hampered by rigid party control over scientific enterprises, by a persistent suspicion of the old scientists, and by the choice of more than 10,000 capable middle-aged scientists and engineers to remain in the United States or other Western countries where they received their training.

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Do You Know?

Cold blooded pets such as turtles, chameleons and alligators, may be potential carriers of bacteria of the genus *Salmonella* and infect children.

Jets of water under very high pressure are being used in some Soviet mines to cut *anthracite*, an extremely hard type of coal.

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