A Graduate Course Goes Practical

FRED W. ALLEN, PhD, Southwestern State College, Weatherford, Oklahoma

At a time when scientific developments appear to have no limits, in the age of the Atom and Hydrogen bomb when man can travel faster than sound, when Biological developments have produced the lifesaving antibiotics; when developments in Chemistry and Physics go on at the fastest rate the world has ever known, it seems incongruous indeed that our high school students can graduate without knowing the basic facts of science, incongruous indeed when vocational agriculture and home economics can be substituted for Biology, Chemistry and Physics. In times like these it is important that Science not only be put back into our high schools but that it be given the consideration it so rightfully deserves. The situation found in Colleges is scarcely better than that found in High Schools, especially for the Elementary teacher. We are training Elementary teachers who in turn will be teaching students in the formative years of their lives in the fourth, fifth and sixth grades, at a

time when they are asking questions and are wanting answers, elementary as they may be, about the world about them. Yet it is possible for these Elementary teachers to graduate from College, become certified and teach these students without having any science or at best a methods course in science taught by education departments or a non-laboratory survey course in some general field.

This situation has resulted in a number of Elementary teachers coming back to college after graduation and wanting subject matter science courses on a graduate or fifth year level when they haven't had the undergraduate or even high school pre-requisites. Yet they are teachers, and they are expected to teach elementary science; and it is our job to train them as rapidly and as well as we can under the circumstances. If science isn't taught in the grades and if it isn't put back into the High Schools and if students continue to come to college unprepared for college science, where, in Heaven's name are the next crops of scientists coming from?

As a partial solution to this problem, Southwestern State College offered for the first time, last summer, a laboratory course given by the Biological Science department called Elementary Science for Teachers. This course was unusually successful and seemed to be exactly what the Elementary Teacher needed in Science. The approach in this course is entirely different from anything one would find in a formal Biology curriculum. The course is so designed that the teacher gets the basic facts in the various branches of science and at the same time is instructed in methods of presenting these facts on an Elementary basis. I like to call it a "How to do things course." The subject matter is essentially non-technical. If, as is usually the case, equipment is not available and cannot be purchased, the teacher is sufficiently trained in this course to make his own equipment in the class room, preferably, with pupil and teacher working together. Activities have been planned so as to require for the most part only home-made, school-made, easily improvised or readily borrowed equipment and apparatus. The school budget has been constantly kept in mind and no activity will strain it. The course is conducted in laboratory fashion, and the simplicity of the experiments makes it possible for the totally inexperienced teacher to proceed with confidence.

A few examples of the activities will serve to illustrate the type of training the teacher gets. In our study of animals, for example, it is pointed out that there are animals with backbones and those without backbones. Rather than to teach them about animals which they will probably never see, such as the Protozoa, sponges, jelly fish, starfish, and so forth, we confine our study to animals they see every day. We point out that animals with backbones are not all alike, and show skeletons of a snake, a fish, a frog, a bird, a cat, and a human being without learning the names of bones make comparisons between them. This raises the question as to why they are not all alike, which in turn leads to other studies of their environment, their food, coloration, distribution and their economic importance. In order that the teachers may keep animals in the school room, they learn how to construct various animal habitats, in an aquarium and terrarium. If the aquarium or terrarium cannot be purchased for their school room, the teacher learns how to make them. A good deal of the course consists in making things to take back to their own classroom as aids in their science teaching. After making an aquarium from glass, angle iron and aquarium cement, they are required to set up a balanced aquarium. This is not only interesting to do, but can be used to demonstrate the life-balance between the water plants that furnish the oxygen for the fish and how, in turn, the fish furnish the nitrogenous wastes necessary for plant growth. With this demonstration aquarium, it can be clearly shown why fish must have gills and not lungs, as well as many other basic scientific principles of life

and growth. They learn also that some animals like frogs and toads live semi-aquatic lives. With a little window glass, a cake pan and some plaster of Paris the students can make a terrarium in which they can keep and study these animals in the class room. A similar terrarium may be made for reptiles, such as turtles, horned toads and lizards. A pair of Hamsters can be kept in the school room for the study of mammals. When litters of hamsters come along, they can be used in feeding experiments. Diets deficient in the various foods and vitamins can be purchased from the Biological supply companies. The students can watch these animals from day to day and keep records of their growth, weight and any effects of deficiencies in diet.

Our studies of plants include making a survey of the kinds of trees in a given area. At Southwestern, we have on the campus more than fifty different kinds of trees, many of them native to Oklahoma. Each teacher is required to know the names of the common Oklahoma trees, make a leaf collection and know for what purpose each kind of tree is used. The same thing is done for wild flowers. In connection with flowers the teacher studies pollination of plants and the part insects play in this process. Films are available to supplement this work. Insects are always interesting to pupil and teacher alike and much can be learned from making an insect collection. Killing bottles, nets, and insect boxes can be made in the class room. Various projects or units can be assigned about insects, such as which are beneficial to man, which destroy his crops, which produce food, drugs and clothing. Silk worm eggs can be purchased from any Biological supply house, and the silkworms reared in the classroom. These are allowed to hatch into the moth which in turn will produce more eggs, and the entire life cycle can be studied. The silk from the cocoon can be spun into a silk thread and used. The study and control of insects pests is always practical.

In the physical sciences the teacher learns the principle of simple machines, such as the lever, inclined plane, screw, wedge, wheel and axle, pulley and windlass. In the study of electricity the teacher makes a wet-cell battery and actually tests the amount of current generated by it. Once this principle is learned it is easy to apply it to the dry cell battery and the storage battery in the car. Once the teacher learns how electricity is generated, it is a simple matter to use batteries to ring door bells or light lights. Simple electrical hook-ups are taught such as how to fix the plug on the iron or toaster, and why houses have fuses in the electric circuit.

These are only a few of the activities in this course for teachers of science. In addition, there are field trips which point out and explain community problems, such as where their drinking water comes from, how it is chlorinated and how it finally gets into their homes. A trip is made to the sewage disposal plant, and that process explained.

This course was a natural out-growth of the fifth-year program at Southwestern State College and offers the Elementary Science teacher an opportunity to broaden his scope of knowledge, and at the same time teaches him to do many things in Science with the equipment he can make for himself.

By modifying this course it can be made suitable as an undergraduate course for senior elementary majors. Since such a course as this was not available before, we feel that both the under-graduate program as well as the fifth-year program will be strengthened in the Science field.