Facts must be taught, but as instruments for the achievement of intellectual growth. There is a growing conviction among science teachers of general education courses that the way science content is dealt with is at least as important as the content alone. If the ideas of science and its procedures are important, the science content must be dealt with in such a way that students will recognize other examples and applications for the ideas and procedures illustrated by particular scientific facts. It is the teacher's responsibility to present material in such a way that students develop an increased understanding of scientific concepts, ability to use critical thinking, and an appreciation of scientific enquiry and attitudes.

To achieve these goals, the teacher must be personally convinced of their desirability. Every effort should be made to encourage students to develop the ability to structure their own thinking for the solution of a problem by utilizing whatever scientific knowledge is appropriate to the situation. Students need help in beginning to develop the ability to focus attention from subject matter facts to larger principles and concepts.

Summary

The recognition for the need for science courses specifically designed for the nonmajor in science has been indicated by numerous educators in junior colleges as well as those interested in science as part of a general education program in other post-high school institutions. However, no complete agreement about the nature of these courses is evident as yet, although certain directions have been manifested. The goal of general education is to help students to live in a world-wide community. Consequently, it is highly desirable for students to have an appreciation of scientific achievements as well as a comprehension of scientific limitations and hazards.

One approach to the achievement of this goal is to plan and experiment with new courses of a broader scope: Courses that can be constructed out of the subject matter of several disciplines and organized around a central concept. A kind of planning and teaching which students, who are not science majors, can readily comprehend and have recourse to in orienting themselves to an intricate and complex universe.

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Back to Chickens?

• W. F. Hollander, Iowa State University, Ames

The author, a geneticist, pleas for the good old days when the alert teacher used the chicken to demonstrate quite a bit about biology. He describes techniques to keep the birds happy.

When I was a kid in school, our teacher had a makeshift incubator and she'd put in a dozen eggs from the grocery store every few weeks to show us the embryos. Them were the good old days—try to buy fertile eggs in a grocery now! So we send off to the supply company for embryos—beautifully stained, mounted, or sectioned, but dead.

Since kids like to watch development through a window in the shell, or see the

pulsating heart of a three-day embryo in a dish, and maybe even learn something as they gaze, what can be done? In rural areas one may find farms even yet with an old-fashioned flock, including rooster, where fertile eggs can be bought. Or one can send off to certain hatcheries, such as McMurray's in Webster City, Iowa, for eggs (at about three dollars a dozen!). Or perhaps one can locate, with the students' aid, a local bantam breeder, not so rare as you might think. Some school boys have their own bantams, even in town.

Most county and state fairs have a poultry show. Here are the fanciers' pride and joy on display—fowls you have to see to believe, of every color, size, and shape. The fair brings these bizarre birds out of hiding from backyards here and there, even basements and garages. At the fair one can jot down addresses and perhaps even talk with the breeders, explain the school-room problem. But don't expect most fanciers to reply to a letter.

Of course there is still another solution—getting a rooster and one or more hens and producing eggs right in the lab. How many biology students can say they saw the egg laid, wrote the date on the shell with pencil, and followed the growth of its embryo? Why, they would actually know the embryo's father and mother. They might even learn the rooster's part in the story.

Ah, but chickens in the lab? Heaven (or principal) forbid! Roosters crow, hens cackle, they flap their wings, they raise dust, they might even have ectoparasites (horrible thought to a biologist!). Moreover, they would thirst or starve over the holidays. Absolutely impossible situation. But thinkable.

Most people these days do not realize what good pets chickens can be, especially the bantams. Like other animals, they may present problems, but a biologist should be able to solve most of them.

What about caging? Well, the chickens aren't fussy. I prefer a cage with at least four square feet floor area for a pair, with a nest box, and hay (not excelsior) or shavings or similar bedding a couple of inches deep on the floor. Surround the cage with cardboard at least six inches high, so that the bedding will not be scattered out. A coffee can for water, placed outside the bars of the cage so the birds can reach through easily, and another for food, complete the furniture. Clean-up once a week. A plastic sheet under the cage will protect the floor and aid clean-up.

Food? Table scraps from the lunch room, perhaps. Don't forget some meat or milk, the latter desirable as a source of vitamin D also. Egg shells from hard-boiled eggs are relished by the birds as a source of calcium, and some small pebbles for gizzard stones.

Noise is probably the greatest problem. Chickens vocalize their feelings freely. The hens are o. k., but roosters may be unbearable. One solution is to shut the rooster in a dark box during class hours. A de-voicing operation is possible but not usually feasible.

Most breeds except Leghorns will sit and hatch their own eggs. Just let the eggs accumulate in the nest; when there are about a dozen the hen will go broody. No artificial incubator needed!

Raising baby chicks can be simple. I use a cardboard carton with top cut out, sides about a foot high. A goose-neck lamp with a 25-watt bulb leans over the side of the box for heat. The bulb should be about an inch above the chicks' backs at first. When the chicks are partly feathered, at about three weeks, the light may not be needed any more. On the floor of the box I put some bedding and a handful of coarse sand. Tuna-fish cans or the like serve as food and water dishes. Chicks have omnivorous tastes and only require food to be bite-size. Bread and milk are relished, as well as grain and salad.

Chickens raised this way are likely to be uninterestingly free of parasites and diseases. Maturity is gradual in development and depends on breed somewhat; about six months young hens usually are laying, but the eggs are not very large at first. Some tough old birds may survive for seven years or more, but most fail to get past three, in my experience.

Yes, indeed, for new life in the biology lab, the chicken should come before the egg. And if one must terminate the project, there can be dissection, and even a tasty pot-pie. It may not be BSCS, but there are times when I prefer the good old days!

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