9.

Teaching about Prenatal Development in Biology

Elisabet O. Orville

Dr. Maurice J. Mahoney's seminar on "Human Fetal Development" attracted a pleasantly heterogeneous group of New Haven teachers. Some of us were in science, others in math; there were also a home economist and a sixth-grade teacher. We were represented fairly evenly by middle and high school teachers. I think we all knew each other by sight but many of us had not really met before. Our common bond was that we had all signed up for a large commitment of time and effort in the next four months and would therefore get to know each other well as we attended seminar meetings and researched our curriculum units.

It was stimulating to meet with teachers of such varied backgrounds; on the high school level we tend to compartmentalize our subjects. Math is rarely taught in a biology class, and genetics does not appear in algebra classes. But as one of the math teachers in the seminar pointed out, "There really shouldn't be any barriers between math and science. There certainly aren't on the research level." The seminars offered by the Yale-New Haven Teachers Institute encourage this philosophy by being interdisciplinary in nature.

The crucial element in bringing such a mixed lot together is, of course, the seminar leader. As well as being our "expert," he or she must try to understand each teacher's classroom situation, needs, and philosophy so that the seminar can be shaped into a form that is the most useful for all. I think that our seminar on "Human Fetal Development" worked extremely well because of the flexibility and concern of the seminar leader. He did not just impart information, but always asked, "How can you use this in your classroom?" Communication was definitely a two-way path.

The field of human genetics and fetal development is relatively new and expanding by leaps and bounds. Very little of the information and research techniques has filtered down to the level of high school biology texts (although our students are often aware of the latest sensational advances from watching television).

What we high school teachers learned in college, whether pre- or post-Sputnik, is often what we still teach in our science classes. It may be good classic science, but it is ancient history. Our students deserve better. The books and audiovisual materials we use are often similarly dated due to school budgetary restraints. I have, for instance, a genetics filmstrip at my school which refers to the forty-eight chromosomes in human cells, even though in 1958 it was discovered that there are only forty-six! These are the reasons why we science teachers, especially, need interaction with professionals in our field, in order to upgrade our knowledge.

The other teachers in the seminar felt the same as I, and we had many questions to ask Dr. Mahoney at our first meetings. For instance, Is leukemia inherited? Will the baby be affected if the father has taken drugs? Does the "pill" cause birth defects? We had stored up these questions for years.

When weekly meetings began in May, we settled down to readings, lectures, and discussions on the topics outlined in Dr. Mahoney's bibliography. The readings were comprehensible to all, but sometimes during the discussions on current genetic research even we teachers who had majored in science in college found ourselves in *terra incognita*. The information and techniques were totally new to us. It was good training for us, though, and the math teachers took heart when formulas appeared on the board.

One point on which there was complete agreement among the Fellows was that we needed to learn more laboratory techniques that could be used in our classes. Scientists learn by doing experiments, and we teachers all felt that we would like to bring back some "hands-on" procedures from the seminar so that our students could see for themselves what we were talking about. My biology classes are not "tracked," and the students vary greatly in both their reading and thinking abilities. The one thing they all enjoy doing is experiments. Labwork seems to even out differences among students; the slower ones take pride in working with equipment where the brightest ones will question and go even further than the teacher had planned. I feel strongly (and so do the other science teachers) that a good science course, whether on the middle or high school level, should be based on labwork.

Dr. Mahoney obviously agreed; he arranged for us to visit his laboratory to observe cell culturing and human chromosomes. Unfortunately this area of labwork is difficult to transfer to a school setting, but we arranged the next best thing: we will borrow microscope slides of human tissue from his laboratory, as well as ultrasound pictures and models of developing babies. In addition, he and his associate, Dr. Cara Smith, have already come into our classrooms to talk to our students. Yale does not seem quite so inaccessible any longer.

Probably the most important outcome of any seminar is the curriculum unit that each teacher writes for herself and for other teachers in New Haven. The guidelines for writing such a unit are fairly gentle, gradual, but very insistent.

I decided to write my unit on unborn babies since I teach at McCabe Center for Young Mothers in New Haven. This is a public school that offers pregnant teenagers a regular school curriculum, as well as special support from nurses and social workers.

I was interested in how the fetus is adapted to its intrauterine environment, while at the same time preparing for life outside the womb: a topic that was broad enough to be of value to biology teachers at the other high schools as well as my pregnant teenagers. In individual conferences Dr. Mahoney suggested numerous references. I began to immerse myself in the journals and books at the Yale Medical Library. The field of Perinatology, although new, is large, and I often felt overwhelmed by the sheer volume and technical difficulty of much of the material. It was, however, a great satisfaction to refine it to my layman's level.

Many of the units written by Teachers Institute Fellows in science seminars are extremely factual, in contrast to units in the humanities which express a more personal approach. I suspect that this is because of the nature of the subject. We science teachers all have a lot of "catching up" to do in becoming current in our fields, and this is reflected in our units. I think that the ideal science seminar would be one in which we teachers spend a good deal of time in the laboratory, perhaps just learning basic techniques which would be transferable to our classrooms or maybe venturing further into simple experiments. That would certainly eliminate the ho-hum quality of secondhand information that we often impart, and would definitely make us better science teachers.

When sitting in the Yale Medical School Library surrounded by journals, books and reference cards, it was often easy to forget the real reason I was doing all this research. This is why the lesson plans that we write for our units are so important. They bring us back to the reality of how we are going to use what we have learned in our classrooms.

I soon realized that I would want to include a lesson plan on the etymology of scientific words. The field of Perinatology contains much technical and difficult vocabulary which would be overwhelming to high school students. For this unit I developed a short lesson plan on the Latin and Greek roots of such words as *perinatology, toxemia* and *circumcision.* Students are to look up the meaning of individual roots (*peri- nat- ology*) on a list and then, without using a dictionary, they are to try to figure out the English meanings of the words. It becomes a game for them.

The next step is to make up their own new scientific words by combining various roots. The object is to show them that the imposing language of

science is not sacred, but was invented by scientists as the need arose. The thing to be emphasized is that students should never have to memorize long lists of words, but rather to understand their parts and to enjoy using them.

Another lesson plan in my unit treats the plotting and interpretation of line graphs. Science students should become comfortable with the construction and interpretation of all sorts of graphs and realize that they are useful tools. Occasionally I get the complaint from students that this is NOT a math class and why can't we get on with regular biology? However, the math teachers in the seminar and I would agree that math learning is reinforced if it is taught in science classes as well.

This lesson plan combines graph-making with a discussion of the different variables that affect the growth of the fetus. Students are given the data for normal fetal growth, in grams, from conception to birth and asked to plot them. Then we discuss the other possibilities. Supposing the mother has diabetes, would the baby be larger or smaller than average? The students then make a curve based on these data. Several other variables are considered such as malnourishment, smoking, and twins.

Writing meaningful lesson plans for my unit was not easy; at this point the expertise of the other teachers in the seminar became very important. Each of us presented our lesson plans to the group, which responded with concrete criticism and encouragement based on many years of cumulative teaching experience. Math teachers and middle-school teachers often had special insights to offer the high school teachers, and our seminar leader cheered us all on. Writing the lesson plans was definitely a group process!

The end product of the seminar was a volume of units that was both comprehensive and useful, ranging from genetics and cytology to fetal development, birth defects, and maternal care during pregnancy. A less concrete but just as important result was the closeness that developed among the participants that has helped bring us out of the isolation of our individual school buildings. When the volume of our Institute units came out in the fall, we held a spirited reunion.