A Teaching Seminar for Graduate Teaching Assistants in Zoology

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THE LARGE NUMBER OF STUDENTS enrolled in many undergraduate biology courses has made it necessary to create multiple laboratory sections for a single course. Since these laboratory sections require a number of instructors, biology departments have usually staffed these positions with graduate teaching assistants. These graduate students perform a necessary and worthwhile function and at the same time gain valuable teaching experience. The zoology department of the University of Maryland presently employs more than 50 graduate teaching assistants to complement the teaching program. These teaching assistants are responsible mainly for laboratory teaching and usually begin their experience in the large introductory courses. Because most new teaching assistants come to their first assignment with little teaching experience, they are not expected to begin as polished instructors.

It is important to remember however, that these teaching assistants are responsible for providing an effective learning environment for a large number of students and this task cannot be taken lightly. The more aggressive position taken by the college student is one factor influencing some institutions to reconsider teaching performance and improvement of instruction. Undergraduate students are asking as never before that their courses be taught by experienced and competent individuals, and this includes the laboratory. Conscientious students are no longer content with routine and questionable performances by instructors. In general, students are less tolerant of the system than they used to be, and they rightly question poorly planned and organized instructional processes.

It has become increasingly important that colleges and universities recognize their responsibility for providing the teaching assistant with as much assistance concerning effective teaching as possible (Kramer 1971). A new teaching assistant's attitudes about teaching are shaped, to a great extent, by the models or approaches he has been exposed to earlier. These models may or may not be appropriate for all students and a course or special program in teaching is needed in order to explore the many dimensions of the instructional process. A number of universities now have well defined programs for preparing the graduate teaching assistant (Stockdale and Wochoki 1974). The methods and procedures used in these programs and subsequent evaluation can be of valuable assistance to institutions considering the establishment of similar programs.

In the zoology department at the University of Maryland, all new teaching assistants are required to enroll at least once for one semester hour of credit in "Laboratory Teaching in Zoology." The seminar is scheduled on a regular basis with sessions lasting from one to two hours. During the semester the following topics are considered along with special problems as they arise.

Seminar Topics

1. *Resources and references for teaching zoology.* Selected materials are made available at the first seminar for the students to examine. Students spend time reviewing biology sourcebooks, biology journals, science education journals, selected books and monographs on teaching, and special publications. A general discussion then follows concerning literature devoted principally to teaching in the biological sciences.

2. *Operating audiovisual equipment and preparing audiovisual materials.* Students are instructed on the proper operation of audiovisual equipment available in the department. In addition, they are shown how to prepare special audiovisual materials including trans-

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parencies and 35-mm slides. The role of audiovisual materials in instruction is discussed and students are provided with resources to prepare some of their own visuals. They share ideas with the group.

3. *Microteaching presentations, videotapes, and evaluations.* A teaching assistant teaches a short lesson, with concentration on a specific teaching skill, to the other students and instructor. The instructional sequence is videotaped and then replayed immediately for group evaluation. This procedure provides several sources of feedback. The student may reteach the lesson incorporating suggestions made by the group. Often actual laboratory classes are videotaped and are viewed in groups for evaluation.

4. *Preparing instructional objectives.* Students are provided with two references, Mager (1962) and Koran et al. (1969). They are then provided with a list of statements and are asked to indicate the ones best representing behavioral objectives. These statements become the focal point of a discussion on the role and merits of clearly stated instructional objectives. Students prepare a set of instructional objectives for a future teaching situation which are exchanged and critiqued. Well written and poorly written objectives are then compared.

5. *Comparing laboratory exercises and laboratory investigations.* Students are presented with models of both types for consideration. The specific type is not identified at this point. The models are taken from CUEBS Publication No. 25 (Lee 1965). Students are asked to identify specific characteristics of each model. A discussion then centers around the merits of each model and students identify the investigative model. They are then given a copy of a laboratory exercise and are asked to revise it so that it becomes a laboratory investigation.

6. *Questioning techniques in the laboratory.* Students are presented with a list of questions that may be commonly asked in the laboratory. They are then asked to rate each question as either good or poor and to provide the criteria they used in making their choice. Each question is discussed in terms of its strengths and weaknesses and students examine the characteristics of higher order questions and note differences between convergent and divergent questions. The concluding activity involves constructing some questions for use in teaching situations. The reference for this activity is Carin and Sund (1971).

7. *Constructing and criticizing evaluation instruments.* Students are asked to read the first section of the CUEBS Publication No. 20 (Nelson et al. 1967), which provides information about evaluation in the biological sciences and assessment of different cognitive levels. Test format is discussed along with merits of the different types of tests. Students then examine some model questions classified according to cognitive levels and are shown how to construct a test matrix. An actual multiple-choice examination prepared for an introductory zoology course is analyzed and students construct a set of multiple-choice questions for inclusion in a future examination. Various item analysis techniques are discussed with examples from old tests and students are shown how to use an item analysis program available at the University of Maryland Computer Science Center.

8. *The audiotutorial and minicourse approach to teaching.* The reference for this activity is CUEBS Publication No. 31 (Creager and Murray 1971), and students also view the film, *The Audio-Tutorial System,* produced by S. N. Postlethwait at Purdue University. A discussion follows concerning the merits and problems associated with these approaches.

9. *Research studies on teaching and learning.* An overview for this topic is provided by McKeachie (1971), and students are asked to read one or two selected research reports from journals concerning the teaching and learning process at the college level. The contents of these papers are carefully discussed and students explore the possibilities of improving instruction based on these types of reports. Summary data from Ronan (1972) is also included with this general topic.

10. *Developing a teaching philosophy.* Various zoology faculty members present their own teaching philosophies. Students and faculty discuss teaching philosophy and styles of teaching and students are asked to compose a statement on their teaching philosophies.

Student Feedback

The seminar is designed to be an open discussion with as much student participation as possible. No examinations are given and satisfactory completion of the seminar requires only that students attend regularly and complete assigned activities. A minimum of reading is required, although a great deal is encouraged, and students can complete most of the assigned activities during class time. Although responsibility for the seminar is assumed by two members of the zoology faculty, many other faculty members participate when called upon.

After completing the seminar, students were asked to complete an open-ended response type of questionnaire. The most common responses are listed below:

1. Most students feel the best aspects of the seminar are (i) exchange of teaching ideas with other TAs and faculty; (ii) discussion of specific problems; (iii) interest shown in teaching by the department; and (iv) being allowed the freedom to express ideas and criticisms.

2. They list the worst aspects as (i) late afternoon meeting time of class; (ii) discussions that are not always sufficiently structured; (iii) too little follow-up on each topic; and (iv) too much time devoted to some topics.

3. They feel the most useful topics are (i) test construction and evaluation; and (ii) developing a teaching philosophy. They consider the least useful topics to be (i) auditorial and minicourses; and (ii) specific personal teaching problems.

4. Their suggested improvements include (i) involving and providing more faculty input; (ii) requiring

more specific readings; (iii) providing more structure in discussions; and (iv) meeting more often at the beginning of the semester and then less often as TAs become more aquainted with their tasks.

The fact that 83% of the students were satisfied with what they had learned in the seminar provides motivation for the faculty to maintain the effort. Course directors have been well pleased with the performance of TAs who have completed the course. With these encouraging results, the seminar is being continued.

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Undergraduate Research Projects

NSF grants totaling $2.8 million will support 222 projects involving 1,765 college students in apprenticeships in scientific research. Participating students are full-time undergraduates, usually between the junior and senior year, who have demonstrated promise while completing a substantial part of their college science preparation. Students in URP projects are selected to work in specific projects closely matched to their interests and background. URP grants were made in all fields of science, but highest priority was given to energy-related general research.

Nematodes . . . from p. 226

"giant cells" and are the principal cellular response of susceptible plants infected by root-knot nematodes. These cells are an integral part of this highly specialized host-parasite relationship, serving as the permanent feeding sites for these nematodes.

On plants inoculated eight weeks before, galling will be conspicuous (fig. 3). When extensive galling occurs, the efficiency of the root system in absorption and translocation of nutrients and water is greatly impaired, resulting in reduced plant vigor and eventual stunting of the plants. On the plant stained with acid fuchsin-lactophenol, the greatly enlarged globose females will be visible within the galls. Sometimes the giant cells mentioned above will also be visible as a dark-stained mass located in the center of the root near the head of the nematode. On many of the galls a gelatinous mass containing 500–1,000 eggs laid by the female nematode will be visible. The phloxine B stain will greatly facilitate locating the egg masses on the second plant. Many of the eggs observed in the depression slide will show progressive development from one cell to the juvenile stage (fig. 5). Most root-knot nematode species are parthenogenetic, with males rarely being present in a population.

Additional experiments can be done on the pathogenicity of this nematode by adding varying numbers of egg masses to new soil and planting with healthy tomato seedlings. The pathogenicity can be estimated by both a reduction in plant height and vigor, and the amount of galling present on the roots. Other plant species can be inoculated to determine the host range of the root-knot nematode. A host plant is one on which the nematode can feed, reproduce, and produce symptoms (galls).

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Ancient Proverb

Whoever fears to submit any question to the test of free discussion loves his own opinion more than the truth.