

teachers. There are substantial personal and professional benefits to be gained by a graduate student who teaches. These will be important regardless of their career orientation. A student heading into a career in research or industry is not justified in omitting teaching experience from their graduate program merely because "they won't be involved in teaching". The survey of department heads has shown that a significant percentage of current departmental administrators moved into these positions from nonteaching careers. For these heads, as well as for a majority of those who had taught during their careers, teaching as a graduate student was an important factor in shaping their current administrative attitudes toward teaching. Thus, experiences in teaching obtained by graduate students today may influence positively the administrative understanding and support for our teaching programs tomorrow. We should strive to provide a comprehensive, positive experience for a wider sector of our graduate student population. This is in the best interest of developing Ph.D. graduates who will be effective agronomy professionals in research, teaching and administration.

REFERENCES

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The Minnesota graduate student teaching practicum¹

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In 1980, the Agronomy Department at the University of Minnesota initiated a teaching practicum course. This course enables graduate students to participate in discussions pertaining to various aspects of teaching and also assists them in formulating a personal teaching philosophy. Course objectives include developing a positive attitude towards classroom or extension teaching as a professional activity and encouraging pursuit of teaching excellence. Graduate students gain experience in teaching by assisting in one of the department courses, or by conducting an extension project with an agronomy extension specialist as their advisor. Students also gain experience with specific teaching methods using a microteaching approach. Based on surveys of participants in the teaching course from 1980-1982, it was found that the teaching practicum succeeded in achieving these objectives by offering students a broad range of teaching experiences. Former students expressed a desire for more critical evaluation of their classroom performance. The success of this teaching course over the past 3 years indicates that it may serve as a model approach to providing graduate students with a positive teaching experience.

Teacher training is an essential feature of agronomy graduate education (1, 2). Hargrove and Frye (2) found in a survey that many agronomy department heads, faculty, and graduate students agree that teacher training in agronomy could and should be improved, although specific department level programs for improving teacher training are rare. White (3) describes a graduate level teacher training practicum in agricultural economics that incorporates both instruction in teaching and practical teaching experience.

The Department of Agronomy and Plant Genetics at the University of Minnesota offers a teaching practicum entitled "Supervised Teaching Experience in Agronomy" (Agro 8000) for graduate students interested in gaining teaching experience as part of their graduate studies. Graduate students enrolled in the course gain teaching experience by either assisting in one of the department's agronomy or plant breeding courses, or by conducting an extension teaching project. Students also participate in a series of discussions concerning the mechanics and philosophy of teaching. Agro 8000 provides a structure for orienting graduate students, regardless of their career goals, to many of the issues, methods, and skills needed to effectively teach in a department of agronomy. The course also helps participants develop a positive appreciation for teaching as a career activity. Agro 8000 may serve as a useful model for other institutions that wish to develop or improve the graduate student teaching component of their graduate agronomy program. This article describes and evaluates Agro 8000, particularly from the graduate student's perspective, and offers some conclusions regarding the effectiveness of such a practicum.

AGRO 8000: HISTORY AND DESCRIPTION

Agro 8000 was added to the Agronomy and Plant Genetics graduate curriculum in 1980 to provide graduate students with a way to structure and document teaching experience as part of their graduate studies program. Agro 8000 is organized on the basis of the following four postulates:

1. The course should concentrate on actual teaching activities with opportunities for constructive critique of student efforts, discussion of both teaching mechanics and philosophy, and should encourage student self-improvement.
2. Graduate students are knowledgeable about teaching, whether they realize it or not, because of their many years of experience as students under various teachers and educational methods. Thus, instructional sessions organized for the course participants should emphasize discussions or microteaching exercises that maximize active student participation.
3. Faculty participants in the course should be individuals respected by the students as teachers.
4. Faculty from outside the department should be included as resources in the course.

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There are three major components of Agro 8000: actual supervised classroom or extension teaching, instruction in the teaching mechanics needed by a beginning teacher in agronomy, and a forum that encourages the students to improve their teaching skills and to develop a personal teaching philosophy. The students teach in a departmental course or with an extension specialist of their choice. The student teacher's specific responsibilities are defined in advance with their supervising instructor or extension specialist. The specific experience varies depending on the type of course in which the graduate student assists. With either the classroom or extension option, the student participates with the other students registered for Agro 8000 in weekly 2-h discussions during the fall term. These discussions focus on both the mechanics and philosophies of teaching. During the term that students actually teach they meet regularly with both their supervising instructor as well as with the Agro 8000 instructor. These sessions provide the students with the opportunity to obtain instruction and support while they are actively involved in teaching activities. In these sessions the students may decide to experiment with alternative teaching methods, develop strategies for dealing with problems encountered in the classroom, or obtain counsel on handling student-teacher relationship problems.

The weekly teaching discussions held during the fall term provide a time for free exchange of teaching philosophies and ideas, and for helping students gain an understanding of the basic mechanics of teaching in a classroom or extension environment. For many of these sessions, the students have assignments that relate to their actual classroom or extension teaching experience (Table 1). Table 1 presents the discussion topics for Agro 8000 in 1983. Six of the discussion topics listed in Table 1 involve participation by faculty in addition to the Agro 8000 course instructor. These include persons from outside the department. For example, "What is good teaching?" includes two outstanding teachers (one of whom is often from another department) identified by the participating graduate students.

EVALUATION OF AGRO 8000: THE GRADUATE STUDENTS' PERSPECTIVE

The primary objective in evaluating Agro 8000 was to determine how well the course is achieving its original purpose of encouraging good teaching practices and developing positive attitudes towards teaching as a career activity. The other objectives were to:

1. Evaluate the actual experiences gained from the teaching components of Agro 8000.
2. Evaluate the discussion component of Agro 8000.
3. Assess the influence that Agro 8000 has had on the careers of students who have graduated since completing the practicum.

We used two different surveys as sources of data to evaluate Agro 8000. One was the course evaluation forms distributed to the participants by the Agro 8000 instructor and completed immediately upon completion of Agro 8000. We used these forms to evaluate the dis-

Table 1. Agro 8000 fall discussion topics, formats, and assignments.

Topic	Format and assignment
What is good teaching?	Discussion with two effective teachers (identified by Agro 8000 students).
Motivating students to learn.	Discussion with guest resource person from outside department.
Planning a course.	Students prepare course outline and procedures.
Evaluation and writing exams.	Students write and critique exam questions. Guest resource person.
Lecture method.	Students prepare and present microlecture; critiqued by instructor and peers.
Student/teacher relationship.	Discussion with guest resource person.
Discussion and other alternatives to lecture.	Students prepare and present microdiscussion or assignment; critiqued by instructor and peers.
Extension teaching.	Discussion with guest resource person.
Evaluating and improving your teaching.	Discussion with guest resource person.

Table 2. Value of Agro 8000 course components and specific discussion topics as assessed by the course evaluations (1980-1982).

Course component	Mean value rating†	Standard deviation
Overall teaching discussions	5.5	0.7
What is good teaching?	5.9	0.9
Motivating students to learn	5.0	1.2
Course planning	5.1	0.8
Evaluation and exams	5.3	1.2
Lecture method	4.6	1.1
Student/teacher relations	5.0	1.0
Discussion method	4.9	0.9
Extension teaching	5.2	1.0
Overall teaching experience	4.9	0.8

† Rating scale: 1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good, 6 = excellent, 7 = exceptional.

ussion topics and the teaching/extension experience. We also distributed a follow-up survey to all participants who have completed the practicum since 1980. With this survey, we assessed the participants' longer-term view of their teaching experience and determined how Agro 8000 has influenced career choice and job performance.

Table 2 summarizes the results of the course evaluations. Participants were asked to rate each component according to the scale presented in the legend of the table. Overall, the discussion component of Agro 8000 was rated somewhat higher than the actual teaching component. The discussion topic entitled "What is good teaching?" received the highest rating. We attribute the high rating for this session in part to the involvement of faculty who the students identified as highly effective teachers. Accordingly, these instructors possessed the credibility to discuss teaching with these students. The other discussions received a very good or better rating. The topics concerned mostly with the mechanics of teaching, such as "Lecture method" or "Discussion method," were generally rated lower than topics concerned more with philosophy of teaching such as "Motivating students to learn." In more recent offerings of the course, the discussions concerning teaching mechanics have become more student oriented. Students now gain from peer and instructor critique of microteach exercises where they develop and present a

Table 3. Participation by student teachers in classroom and extension options of Agro 8000 (1980-1982).

Option	Percent of student teachers
Classroom options	90
Intro to plant breeding	21
Principles of plant breeding	7
Cytogenetics	17
Field plot design	21
Weed control	7
Morphology, identification of crops, weeds	7
Growth, development, culture, field crops	7
Adaptation, distribution, production, field crops	3
Extension option	10

Table 4. Responsibilities of student teachers in the classroom option of Agro 8000 (1980-1982).

Student teacher responsibilities	Percent of student teachers
Lecturer	52
Lab instructor	35
Discussion leader	35
Question writer	38
Grader	23
Videotaper	14
Tutor	35

lecture or discussion for the rest of the class. The value and interest in these topics have increased since student participation was expanded.

The follow-up survey was sent to all 32 individuals who have completed the course since 1980. Twenty-nine of the participants responded. Eight of these had graduated and were employed at the time the survey was conducted. Of these eight graduates, two were teaching, two were extension agronomists, and all were involved in agronomic research.

Table 3 shows that Agro 8000 participants in the classroom teaching option have assisted in eight courses in the department. The greatest involvement was in the introductory plant breeding course and the undergraduate field plot design course. Ten percent of the respondents chose the extension option for their teaching experience.

Table 4 lists the kinds of teaching responsibilities course participants had in the courses in which they assisted. Responsibilities differed depending on the course, but more than half of the respondents lectured as part of their teaching experience. Over one-third of the student teachers wrote questions for exams and assignments, were lab instructors or recitation leaders, or tutored individual students. Table 4 shows that students enrolled in Agro 8000 gained teaching experience in a broad array of instructional situations.

Table 5 summarizes the evaluations of Agro 8000 provided by the follow-up survey of former students in the course. Participants gave the overall teaching/extension experience a very good rating, which agrees with the rating given to this component of Agro 8000 immediately after completing the practicum (Table 2). Other experiences that were rated very good included meeting with the supervising instructor and the Agro 8000 course coordinator, and writing a teaching philosophy statement

Table 5. Value of Agro 8000 experiences assessed from the follow-up survey of former Agro 8000 participants (1980-1982).

Experience	Mean value rating†	Standard deviation
Overall teaching/extension experience	4.9	1.0
Meeting with supervising instructor	4.9	0.9
Meeting with Agro 8000 instructor	5.0	0.9
Writing philosophy statement	4.6	1.4
Seminar as method of teacher training	3.4	1.5
Agro 8000 as method of teacher training	5.2	1.0
Agro 8000 in improving communication skills	4.3	1.2
Agro 8000 in job training	4.7	1.5

† Rating scale: 1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good, 6 = excellent, 7 = exceptional.

upon completion of the course. Respondents rated Agro 8000 as a good way to improve their communication skills, although this rating was lower than other experiences. Agro 8000 was rated substantially higher than graduate seminar as a method of teacher training. Two respondents commented that the seminar was not a good method of teacher training because it did not involve enough interaction with the audience. Two other respondents felt that a seminar format is too formal and structured for the classroom.

Graduates that participated in Agro 8000 said that the course helped train them for their current jobs. One individual felt that Agro 8000 offered a good chance to think about teaching before accepting a position that involved teaching. Another respondent said, "After Agronomy 8000, I will look upon teaching responsibilities as a positive aspect of a job." About one-third of respondents that have graduated said that Agro 8000 influenced their job choice.

Participants were also asked to list the most valuable experiences gained from the course. One respondent said that, ". . . talking with good teachers about how and why they teach was a valuable aspect of the course." Another participant wrote, "The teaching experience was the most valuable in that it exposed me to the nitty-gritty of teaching at the college level." A third participant believed that the most valuable experience gained from Agro 8000 was, ". . . learning that I didn't want to teach."

Former participants were also asked to comment on how Agro 8000 might be improved. Most commonly, survey respondents desired a more critical evaluation of their teaching by both their supervising instructor with whom they taught and the Agro 8000 course instructor. The microteaching experiences and regularly scheduled meetings with the Agro 8000 instructor during the quarter of teaching (Table 5) are recent modifications in the course which should provide greater opportunities for evaluating participants' teaching performances. All participants who responded to the survey said that they would recommend Agro 8000 to other graduate students.

CONCLUSIONS

We conclude that Agro 8000 has succeeded in achieving its objective of providing a meaningful ex-

perience and understanding of teaching as part of the graduate studies program in agronomy and plant breeding. Participants were offered a broad range of teaching experiences both in subject matter and in method. Agro 8000 students expressed a desire for a more critical evaluation of classroom performance. Course modifications instituted in 1983 will assist the course instructors and the Agro 8000 instructor in evaluating the student teacher's performance more thoroughly and direct the focus of discussions toward critiquing the students.

Agro 8000 has been offered at the university for just 4 years. We have attempted to provide a short-term glimpse of its effectiveness to date. From this perspective, Agro 8000 appears to be a useful model for developing a department level teaching practicum for graduate studies in agronomy.

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Teaching experiences of crop science teaching assistants at Iowa State University¹

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Crop science teaching assistants (TAs) in the Agronomy Department at Iowa State University receive a variety of experiences in teaching. The TAs are responsible for assisting in the "Introductory Crop Production" course and for teaching conventional laboratories. In addition, TAs may receive experience in upper-level undergraduate courses. These experiences encompass various teaching methods, such as involvement with guided self-study classes, conventional lecture, lecture-discussion, or all three formats. The TAs are given the opportunity to develop and display teaching material and to prepare and evaluate test questions. In addition to these experiences, the College of Agriculture offers several formal courses for beginning teachers which TAs take to improve their teaching skills.

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Table 1. Formal courses taught by the Agricultural Education Department, College of Agriculture, Iowa State University.

Course	Description
Instruction and Organizational Problems of Beginning Teachers of Agricultural Education	Problems in instructional planning and methodology and in organizing agricultural experience programs
Organizing Agricultural Information for Class, Professional, and Scientific Meetings	Concepts and practices in planning, preparing, and presenting materials used in class and meetings by agriculturalists
Instructional Methods for Teaching in Agricultural Education	Innovations and advanced principles in teaching methods and materials
Seminar in Agricultural Education	Reports and discussion of recent literature and research
Teaching Assistants Orientation Seminar	Survey of basic techniques of college teaching for graduate teaching assistants. Videotaped microteaching experiences emphasizing methods of lecturing, conducting discussion, questioning and reinforcement are included, as well as simple media production and classroom testing and evaluation

THE crop science teaching assistant (TA) is provided a variety of experiences while teaching in the Agronomy Department at Iowa State University. In addition, the Agricultural Education Department in the College of Agriculture offers several formal courses (Table 1) to instruct beginning teachers how to prepare class materials and instruct undergraduate students. The TAs take these courses to improve their teaching skills.

Graduate students on appointment in the Agronomy Department have either research or teaching responsibilities. The fact that TAs do not dilute their efforts with a heavy load of research responsibilities enables the TA to develop teaching proficiency and allows for high quality classroom instruction for undergraduates. Research assistants are not required to teach, but with the consent of their major professor and a member of the teaching staff, they may teach one or more semesters in their area of interest.

Half-time crop science TAs spend approximately 9 h/week teaching. During their first semester, TAs spend time in an audio-tutorial (Postlethwait, 1967; Green et al., 1973) learning center teaching the "Principles of Crop Production" course (Table 2). In addition to these hours, the TA spends 9 to 10 h learning the subject matter of this course and 4 h learning the subject matter for the grain-forage crop production laboratory they will teach their second semester. As TAs become more experienced, they assist in different upper-level undergraduate courses.

TEACHING EXPERIENCES

In the audio-tutorial learning center, TAs are able to communicate thoughts and ideas to individual students. It is essential the TAs be well versed in the subject matter to create good teacher-student interaction. To aid in student learning and understanding, TAs are encouraged to develop teaching material for display. For