Inserting "World Issues" Teaching Units into Existing Courses Receives Positive Student Evaluations at Nebraska

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Abstract

Agriculture is in a stage of rapid change that will continue into the future. These changes are greatly affected by issues of world population/food production trends, land and water resource, fossil fuel depletion, predicted climate change, biodiversity loss, and world grain trade. These issues were incorporated into a sophomore-level field crop production course at the University of Nebraska in 1992. After completion of units on these issues, students responded to a questionnaire inquiring about interest and usefulness of the units, and whether the issues had been studied previously at the University. Students perceived the issues of "land and water resource" and "world grain trade" to be of most interest, and "predicted climate change" and "biodiversity loss" to be of least interest. Although student interest varied, students perceived study of all issues to be useful. All issues except "land and water resource" had been studied by less than 50% of the students. Efforts to incorporate these issues into agricultural science courses are needed.

Introduction

Agriculture has always been in a state of constant change, but the rate of change is increasing and will continue to accelerate in the future. Although the driving forces for these changes are complicated, concerns about world population growth, utilization of renewable and non-renewable resources, projections of climate change, and the complexity of the world marketplace are contributing factors.

These issues are not new, but rather their urgency and importance are becoming more apparent each year. World population has doubled since 1950, and is projected to double again during the next century (Loomis and Connor, 1992). Availability and quality of our soil and water resources is increasingly questioned (Brown, 1991). Gene pools available for developing improved cultivars continue to decline (Duvik, 1986). Concentration of greenhouse gases in the atmosphere are increasing, which potentially could lead to global warming and percipitation pattern shifts (Adams et al., 1990). Approximately 20% of U.S. grain production is marketed overseas where demand is increasing rapidly and consumers are very quality conscious (U.S. Feed Grains Council, 1992). These issues will profoundly change the way that crops are produced and marketed, and agricultural students need to be better prepared to contribute to future problem solutions.

IDuring the 1992 - 93 academic year, a sophomore-level field crop production course was revised to include one to three class period units on each of the above issues to explore the potential future impact on U.S. crop production. Efforts to incorporate some of these issues into sustainable agriculture courses (King and Francis, 1994) and other agricultural courses (Barbarick, 1992; Fairbanks, 1990) has been documented, but they report little information about student preceptions of these efforts.

The objective of this paper is to report the student perceptions of interest and usefulness of efforts to teach short units on world population/food production trends, land and water resource, fossil fuel depletion, predicted climate change, biodiversity loss and world grain trade in a field crop production course.

Course Description

Field Crop Production (Agronomy 204) is designed as a service course for sophomore-level students from all majors in the agricultural and natural resource sciences. Pre-requisite courses are Introductory Crop Science and Introductory Soil Science. The overall course objective is "integration of principles of crop and soil science, plant breeding, climatology and integrated pest management in the development and evaluation of crop management practices". Instructional techniques consisted of lectures, including video-tape and guest lecture presentations, and group exercises using the CROPROD computer simulation program (Waldren, 1983). Course enrollment is 50 to 70 students per semester with approximately equal numbers of sophomores, juniors and seniors. Approximately 75% of the enrolled students have Agronomy, Agricultural Economics or General Agriculture majors, with the balance majoring in Agricultural Education, Animal Science, Mechanized Agriculture, and Natural Resources (either Forestry Fisheries and Wildlife, Soil Science, or Water Science).

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Methods

During the Fall 1992 and Spring 1993 semesters, one class period per topic was devoted to the potential future impact of world population/food production trends, soil and water resource, biodiversity loss, fossil fuel depletion, and predicted climate change on U.S. crop production (Table 1). Three class periods were also devoted to world grain trade. Each class period consisted of discussion of assigned reading material, instructor presentation of additional information by lecture or use of video tapes, and student—instructor interaction about the future impact on U.S. crop production. These class sessions were held during the first three weeks of the semester. After completing these units students were asked to evaluate them for perceived interest and usefulness using a questionnaire. The questionnaire also asked questions about previous study of these issues at the University of Nebraska, and if adequate time had been allocated to each issue. One hundred three out of 112 students enrolled during the two semesters completed the questionnaire. Of the 103 students, 35 majored in Agricultural Economics, 23 in Agronomy, 22 in General Agriculture, and 11 in Natural Resources (including Soil Science and Water Science). Other majors represented included Mechanized Systems Management, Animal Science and Agricultural Education.

The student evaluations were analyzed by calculation of chi squares based on the number of student responses for each alternative, and significant differences were declared at $P \leq 0.05$. Data anaysis was conducted by semester the course was taught, year and major. No differences were found for semesters taught, and very few differences for class. There were no interactions. To simplify data presentation, average rankings across majors and years were calculated and analyzed by analysis of variance when no differences were found among majors.

Results

Perceived Interest

Responses for all students indicated that "land and water resource", and "world grain trade" issues were of greatest interest, and that "predicted climate change" and "biodiversity loss" were of least interest (Table 2). No differences were found for class (i.e. sophomore vs junior vs senior). Differences among majors were found only for the issues of "fossil fuel depletion" and "world grain trade". Students with Natural Resource majors found both of these topics to be less interesting than other students majors. Students with General Agricultural majors found "fossil fuel depletion" and Agricultural Economics majors found "world grain trade" more interesting than students with other majors.

Perceived Usefulness

Students reported that all the issues were useful (Table 2), although they perceived that "land and water resource", and "world grain trade" issues were the most useful. There was an obvious relationship between student interest and perceived usefulness of topics. However, many students perceived the issues "predicted climate change" and "biodiversity loss" to be uninteresting, but useful to study. No differences among class were found. Differences among majors were found only for the issues "world population/food production trends" and "predicted climate change" topics (Table 2). Students with General Agriculture majors perceived these issues to be less useful than other students. The issue of "world population/food production trends" was perceived to be more useful by students with Natural Resource majors, while "predicted climate change" was perceived to more useful by students with Agronomy and Agricultural Economics majors than other students.

Previously Studied

There was no difference among students in sophomore, junior or senior classes for whether a topic had been previously studied at the University of Nebraska. All issues, except "land and water resource", had been previously studied by less than 50% of the students (Table 3). In contrast to the average, more than 73% of Natural Resource majors had previously studied all the issues except "world grain trade". "World grain trade" had been studied previously by 72% of students with Agricultural Economics majors. Several of the issues had been previously studied by less than 30% of students with some majors. The results suggest that these issues are primarily taught in freshman level courses that are required or commonly selected as electives by students with Natural Resource majors.

Most students felt that the amount of class time devoted to each of these topics was appropriate (Table 2). Students with Natural Resource majors indicated that more time should be spent studying "land and water resource" and "biodiversity loss" issues than the other students.

Discussion and Conclusions

Student responses indicated that the majority of agricultural science majors had not previously studied the issues of world population/food production trends, land and water resource, fossil fuel depletion, predicted climate change, biodiversity loss, and world grain trade at the University of Nebraska. Most of these topics appeared to be addressed in introductory level courses that were commonly taken by Natural Resource students, but not agricultural science students.

Major changes in crop production are on the horizon, at least partly resulting from the impact of these issues. Therefore, they need to be addressed in university agricultural science courses. Students perceived study of these issues to be both interesting and useful. Efforts by university faculty members teaching agricultural science courses to incorporate these issues into courses are needed (Barbarick, 1992; Fairbanks, 1990, King and Francis, 1994). In this case, students responded favorably to the effort.

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BOOK REVIEWS

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California Fertilizer Association *Western Fertilizer Handbook.* 8th Edition, Interstate Publishers Inc., Box 50, Danville, IL 61834-0050. 338 pp inc. Appendix and Glossary paperback $19.95

This the eighth edition of the Western Fertilizer Handbook. According to its editorial committee, the 8th edition continues the traditions of the previous editions in that the information it contains has direct application to the agricultural industry. The 8th edition does however, differ from the previous volumes in that (1) the information about horticulture has been placed in a separate "horticulture edition," first printed in 1990, and (2) there is more focus on fertilizers and environmental quality in the 8th edition. This and previous editions are part of the efforts of the California Fertilizer Association since 1923 to promote progress within the fertilizer industry, so that an efficient and profitable agricultural industry may be maintained.

The first 4 chapters deal with soils, plants, water and the elements the plant needs to grow. This is followed by three chapters that deal directly with fertilizer — types, formulation, storage, handling, and methods of applications. Soil and tissue testing are then considered, and soil amendments are discussed. This chapter includes several pages on understanding and managing salt affected soils - a major and growing problem in semi-arid regions. Best management practices are included in a separate chapter. It appears that this term is applied to the common and very necessary practice of putting together information from academic and government sources with common sense "to form a system that is most profitable to the grower." It is strange to me that this needs to be identified with a separate nomenclature, for it has always seemed to me that producers who did not do that had not survived to remain in business, and we therefore, need not consider them. In this, the importance of soil testing, nutrient management, and conservation tillage are emphasized. One might reasonably ask here — where is the water management in all this? In semi-arid climates, it affects decisions made in all best management systems. The point is made however, that irrigation and nutrient application BMPS must be coordinated to minimize nutrient and water losses.

This brings us nicely into the final chapter of the book - Fertilizers and the Environment. It is interesting to note that the positive aspects of fertilizers are emphasized (9 pages). A section entitled "Fertilizer Facts" has in it the problems of fertilizer elements entering water systems because of mis- management (1 page). I'm not sure I consider this to be a balanced treatment of a very pertinent topic where fertilizers are concerned. Even so, such a discussion is probably outside the stated goals of the handbook.

Appendix A includes what is termed a "Model Law" relating to fertilizer materials. Appendix B consists of 24 pages of really useful unit conversion tables. This could (for me anyway) be the most useful part of the book. For example, the table converting pounds per acre to pounds per 100 square feet relates directly to rapid (and often incorrect, I'm sure) calculations I usually make in my head when setting my fertilizer spreader to fertilize my lawn/garden and in calculating the gallons of water required to put on an inch of water. A 22 page Glossary follows the Appendix.

Each chapter has a list of supplemental readings at the end. These are mostly books and/or monographs that will be recognized as excellent information sources by most who work in soil fertility. The book is well illustrated with diagrams, charts, and photos, including 12 pages with 2 photos each of nutrient deficiencies in various crops. There are many tables of data, but not so many that one becomes tired of trying to sort them out. They are adequately explained near-by in the text.

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