CASE REPORT

Freshman/Sophomore Seminar Depicts Systems Approaches to Agricultural Problems

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Abstract

The course reported here is an offspring of the National Agricultural and Natural Resources Curriculum Project, Food and Agricultural Systems Task Group. Topics discussed in the course included learning styles and problem solving, systems approaches to problem solving in agriculture, and a case study involving a Saturday field trip. The students who participated in this small class benefitted from the experiential learning process and developed an understanding of the relevance of a holistic systems approach to problem situations. Reflections on this new learning experience, from the viewpoint of the course facilitators, are shared in this report.

Introduction

The focus of much of the discussion on undergraduate education that has taken place on nearly every college and university campus during the past five years has been upon both what students are expected to learn and how the faculty can more effectively help them in this process.[1] The experiment reported here was designed to make a small contribution to the answers to both of these concerns, and is an offspring of the National Agricultural and Natural Resources Curriculum Project, Food and Agricultural Systems Task Group [9]. In the Spring Semester of 1989, we offered a one-hour seminar course, "An Introduction to Agricultural Systems Analysis," for freshmen/sophomore students enrolled in agricultural curricula at the University of Illinois. Both of the University of Illinois faculty members involved had attended the two-week faculty training workshop on systems approaches held at Colorado State University in May-June 1986. Our Australian colleague was to be at the University of Illinois for part of Spring Semester and, as he has considerable experience with this approach to learning at Hawkesbury Agricultural College, we decided to use the opportunity to try this course.[2]

This decision was bolstered by the report *Enhancing the Quality of Undergraduate Education at the University of Illinois at Urbana-Champaign*, prepared by an ad hoc committee of the University Senate [12]. That report stated that ... "With respect to improving faculty-student interaction, we propose the introduction of a freshman-sophomore seminar program. During each of the first two years, all UIUC undergraduates should take at least one seminar, taught by a faculty member, with an enrollment not to exceed 15 students."... (p. 59). We also received encouragement and support from the Director of Resident Instruction, College of Agriculture.

The objective of the course offering was to determine if this alternative learning process could be adequately developed in a seminar framework to serve as a worthwhile addition to agricultural curricula. In this report, we discuss the content of the course and the processes involved in its conduct. We also share our observations based on this small sample.

Course

Students:

The experimental course was advertised by mailing announcements to all second-semester freshmen and sophomores in the College of Agriculture who had grade point averages of at least 3.5 on a 5.0 point scale. An organizational meeting was held to provide additional information to prospective students. Sixteen students enrolled in the course, eight freshmen and eight sophomores. There were nine females and seven males. Five were majors in Agricultural Economics, nine in Animal Sciences, one in Agricultural Communications and one in Food Science. Agricultural Economics and Animal Sciences students account for about 47 percent of those in agricultural curricula in the College. Enrollment in the course corresponded closely both to the home departments of the instructors and the numbering of the course (AgEc/AnSci 199).

Organization:

The course met two hours once per week for the second half of the semester for one semester hour of credit. Six sessions were offered in a workshop format. These sessions were organized on three themes with two sessions devoted to each theme. The three themes were: problem solving and learning, systems approaches to problem solving in agriculture, and a case study. The case study included a Saturday field trip.

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[1] See for example, Ellerbrock [5].

[2] Hawkesbury Agricultural College has been using the systems approach as a vehicle for curriculum delivery for the past eight years. This non-traditional approach is described in Bawden et al. [1]. Students in the program are evaluated according to three primary desired competencies: (1) systems thinking, (2) autonomous learning and (3) communication skills. Wilson, also at Hawkesbury, provides a stepwise description of building simple systems models applied to farming [14].

All the meetings, other than the field trip, took place in the same seminar room setting which had audio-visual facilities and flexible seating arrangement. This made it possible for the seating to be changed according to the nature of the class activity. When an instructor presented material for the whole class, often with the aid of an overhead projector, the class faced him in a semi-circular arrangement. At other times, students worked in pairs or in groups of four or five. For most activities the class of sixteen students worked in three groups, each working with a staff facilitator in smaller circles. A person was designated to record the work of each group on large sheets of paper which could be posted for later discussion. Every attempt was made for the course members to feel comfortable within the informal setting and for people to get to know each other. Participants introduced themselves at the beginning of the first meeting in terms of their background, major, and their interest in this particular course. Name tags were worn at all class meetings.

Five to ten minutes were used at the beginning of each session both to link up with the previous session and to "break the ice" in generating an atmosphere conducive to student participation. This participation was seen by the students as a significant positive feature of the course as indicated in their feedback. We, as staff facilitators of the process, had to make a deliberate attempt to change some of our own attitudes and behavior in relinquishing control and becoming more directly involved as co-learners.

We observed over time that our input to the group process in the role of facilitators was necessary, both to encourage the process and to make more efficient use of the limited time available to us. Neither the groups nor the facilitators remained the same for different activities with the exception of the case study, for which group composition was maintained. This was necessary for the completion of the assigned task and its documentation. Relevant reading material was developed and handed out as the course progressed.

Content:

The first workshop session focused on the concept of learning and problem solving as two aspects of the same fundamental process. All participants went through an exercise to determine their respective learning styles [7]. We followed with puzzle solving exercises chosen from Whimbey and Lochhead [13] and modified where possible to give an agricultural context. Students with different individual learning styles were paired for the puzzle solving exercises. The objective of these exercises was for learners to relate their own approaches to puzzle solving to their respective learning styles and also to observe approaches adopted by their partners, and to reflect and report on the process. The session was concluded with a discussion of Kolb's learning cycle [6] and its application to activities undertaken during the session.

The second workshop session on this theme concentrated on a formal problem solving exercise which was undertaken by learners as individuals, as pairs and as groups of four. We used the *Desert Survival Situation* [8] as our class exercise in this session. The objectives of illustrating the differences in processes used and the general improvement in outcomes for groups of learners compared to individuals was easily achieved in this exercise. The importance of active listening and consensus building in group learning situations was clearly grasped by the class.

As an introduction to a learner-centered approach, very different from the format these particular learners were accustomed to, the first two workshop sessions were extremely successful. Conscious reflection on problem solving methods and sharing of experiences by group members were key elements at this stage of the course, and time devoted to these activities was essential for the subsequent learning experiences in the course, which all involved work in groups.

The theme of the next two sessions was systems approaches to problem solving in agriculture. The concept of agriculture as a human activity system characterized by complexity and change was introduced and the need for new, systemic ways of dealing with agricultural situations was established. Learning was seen as central to all systems approaches to improving agricultural situations. The complementary nature of holistic (or systemic) and reductionist methodologies in solving problems was illustrated using appropriate agricultural examples. The relevance of the soft systems methodology [3] in analyzing human activity systems was discussed, thus leading to the use of such techniques as "mind mapping" in developing a "rich picture" of a complex situation.[3] The three staff facilitators and an additional helper took part in a role play of a complex agricultural problem of local relevance. This problem situation was the raising of mink to be used in making fur coats, as viewed by proponents and opponents. The students, in three groups, then developed a rich picture of this situation.

In the next session, the divergent phase of the analytical process was related to key stages of Checkland's soft systems methodology [10], again using several examples that were familiar to the students. One that we developed in some detail was the problem situation of starting up and fostering the effectiveness of a new hypothetical "Illini Aggies" student club. Techniques useful in systems analysis including system identification, definition, and modeling were practiced using agricultural examples. Exposure to Checkland's soft systems methodology through these exercises in the time available was designed to prepare learners for taking a systems approach to the case study situation in the next stage of the course.

For the case study, the complex issue of the location of a storage facility for low level radioactive waste in the State of Illinois was chosen as the problem situation. This offered an opportunity for students to see a real life issue impinging on a rural community and the diverse views of organizations and members of the public concerned with the issue. The last two workshop sessions, and the field trip were devoted to this component of the course. In addition, the students organized small group meetings to complete the case study.

One workshop session was led by an invited resource person who presented background information about the issue, views of the State and that of one sector of the public. During the visit to the site, the students listened to the views of another sector of the community and also formed a first hand impression of the problem situation. At the last workshop session each group was assigned a hypothetical "client" whose concerns regarding the issue in question was to be the problem for systems analysis by the student group

[3]Mind maps, key words linked based on relationship between them, are powerful tools for the visualizing complex situations [2].

of "consultants." Although we adopted Checkland's soft systems methodology as the guiding sequence of steps in working towards improvement in the client's problem situation, because of time constraints students did not have the opportunity to progress with the analysis interactively or to reach consensus through on-going dialogue with owners of the problem. Despite this limitation, the three groups took the analysis to an acceptable degree of completion and documented the outcome.

Reports:

In addition to a group report on the case study outlining the systems analysis and suggestions for change, each student was asked to submit a separate report for summative assessment, containing their personal reflections on the whole course and the learning outcomes that were experienced. The value of maintaining a portfolio was highlighted at the beginning of the course and students were encouraged to draw from the portfolio to prepare the report on reflections.

Both reports were used for assessment. Written feedback was offered to each student on the group report and on the individual statements. Grades were assigned on the conventional A-E scale for each student. The alternative of grading on a satisfactory/unsatisfactory basis is being considered for the future, although we have mixed feelings about whether this change should be made. While grade decisions would be easier to make, we are (perhaps tradition bound) concerned about the potential effect on student motivation.

As indicated by their individual reports, students varied in their ability to reflect on their involvement in the course and to relate those experiences to their overall learning strategies. In its simplest form, the report was a clear description of class activities. Others used the report to evaluate the merits and demerits of the course. However, most of the students presented a reflective and critical look at major aspects of the alternate approach to learning and problem solving, and related these to their own learning strategies.

Ideally, a course of this nature should provide opportunities at various points during the course for students to practice this key process of integrating action and reflection. These could then be documented for presentation to the facilitator of learning, who would offer feedback on the process and content, in an on-going form of interdependent learning. In retrospect, this might have been accomplished in this course by requiring students to submit their reflections for review on a weekly basis throughout the course.

Management:

The systems approach lends itself well to team teaching because more than one perspective is thus assured. We found that team teaching in this context was particularly helpful in the planning of the course, both with respect to deciding prior to the beginning of the course what topics and ideas to develop, and in making adjustments to these plans based on our experiences as the course developed with the students.

The class met on Thursday afternoon from 3:00 to 5:00 p.m. Our teaching team would meet for about a half hour on Friday morning to critique the previous day's class; for about an hour on Monday to select the specific ideas to be developed in the next class; and for about two hours on Tuesday to actually work through many of the classroom exercises that the class would be working through on Thursday. We found this joint preparation time to be very helpful in deciding the details of the lecture and participation activities, and in anticipating the amount of time required as well as some of the questions and concerns that students would have in the process of the class work and related assignments. In addition to these team preparation times, each of us also researched or developed materials to be discussed at these team meetings or in class.

Evaluation:

Student feedback was solicited in two forms: individual reports reflecting on their experiences during the course, and a standard course evaluation completed anonymously during the last class meeting and withheld until grades had been entered. As expected, the novelty of this unconventional approach caused a few students to feel that some of the concepts presented were either ambiguous or unclear. Perceived strengths of the course included discovery of individual learning styles, group participation, and interaction with the instructors. Most of the students also developed an understanding of the relevance and use of a holistic systems approach to problem situations.

Conclusion

Based on our experience with this experimental course, we conclude that the learning outcomes demonstrated by the students are the ones that we had desired. The merit of considering problem situations as a whole and the advantage of interdisciplinary approaches that this implies, including the necessity of working with others in addressing "real world" problem situations was experienced. The seminar format that we used, with the low student/teacher (learning facilitator) ratio is, in our opinion, essential for the success of this approach. We also believe that a course such as this should be offered to students early in their college program to be most effective. Portions of advanced courses at the junior/senior level may then choose to extend on the competencies developed in this course. Cox and Edmundson have discussed the desirability of developing executive competencies as well as technical knowledge and skills on the part of our undergraduate majors [4]. They include in these competencies "... decision making, group dynamics, coordinating, communicating and organizing... as well as learning how to think." We believe that this introductory seminar has started these students along the path of realizing that these competencies exist and are important, and has given them a bit of insight on how they may develop them.

References

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(see Murphy on following page)