

Student frustration, anxiety and aggression are contagious and, if not properly managed, will serve as a disincentive to good teaching. Faculty unable to manage these problems may lose their desire to teach. Therefore, a better understanding of student aggression and its remedies may increase teacher retention rates. Likewise, students who enjoy the learning process without undue frustration and aggression might become better and more productive students.

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Strategies for Integrated Teaching

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Introduction

Courses taught in Animal Science or Agronomy at the college and university level have traditionally been discipline and/or species oriented within a department (Schweitzer, 1986). Courses using a team-taught, (Haque and Bradshaw, 1986) integrated approach across discipline, department, and colleges are not common, yet learning styles based on personality type (Barrett et al., 1985; D'Albro, 1983) are very important in the teaching-learning process with students usually reacting favorably to team-taught course offering a variety of learning opportunities. In addition, problem solving (Howell et al., 1982) using case studies is a strategy for integrating several disciplines. This course was developed using a team-taught, problem solving, integrated approach for cow-calf production on rangeland.

Course Description

Livestock Management on Range and Pasture has been taught in the fall semester at the University of Nebraska-Lincoln for the past 26 years. The course is cross listed between the Animal Science Department and the Department of Agronomy. An instructor from each department has teaching and administrative responsibility for 50% of the course. It is a three-credit hour, 400/800 course which can be taken for either undergraduate or graduate credit. Five different instructors have been involved over the life of the course and student enrollment has ranged from 12-32.

The course provides students with first-hand knowledge of the complexity and sophistication of ranching. A case study approach with on-ranch visitation was selected. The course is a planning course with management alternatives serving as the focus for decision making. Problem solving decisions for the cow-calf producer must consider forage production, management and utilization along with animal nutrition, breeding program, and herd health as well as equipment, financing, and marketing. Consequently,

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senior standing and several prerequisites are strongly encouraged. Suggested prerequisite courses include the following: Forage Crop and Range Management or Range Management and Improvement, Feeds and Feeding or Advanced Feeding and Feed Formulation, and Production Economics and Farm Management or Production Economics and Ranch Management.

The course is divided into two sections: a week-long field session in which the students survey the ranch used as the case study and an on-campus, semester-long lecture/discussion. Each student is required to prepare a complete management plan as the major portion of their grade. In addition, some basic field skills such as plant identification and vegetation survey are taught during the field session and evaluated with traditional tested procedures. The course objectives are

1. Develop the skills required to conduct a complete ranch survey including range plant identification, range condition determination, range site classification and degree of plant and pasture utilization.
2. Analyze and interpret the forage, animal, and economic aspects of the ranch unit, including mapping of pastures and physical facilities.
3. Incorporate range and forage improvements such as grazing systems, range seeding, weed control, and hay and supplemental forage management with livestock management such as breeding systems, nutrition, insect and disease control.
4. Develop a comprehensive management plan including marketing strategies and economic analysis for the ranch unit.

The field portion constitutes 25% of the student's grade. During the semester, work sheets are used for selected topics (12%) with the ranch management plan making-up 60% of the total grade. Three percent is allowed for the development of a class notebook.

Characteristics of a Synthesis Course

Agricultural curricula generally include discrete units of instruction in specialized subject matter areas.

The concept of the academic major also emphasizes specialization. However, most career opportunities in agriculture are often holistic in responsibility and require agricultural graduates to integrate information from many related disciplines in the decision making process. Conventional instruction and curricula development neglect the synthesis process. It is an essential step in education of agricultural students, but is often left to experience after graduation.

A synthesis course should be a practicum in management with faculty guidance. It differs from traditional classroom instruction and offers several opportunities in teaching innovation. The goal of the synthesis course is to provide the student the opportunity to integrate existing knowledge into functional management plans which acknowledge the career environment. It should provide the student with confidence that he/she can perform in a professional role. The following characterizes the synthesis course:

1. The development of a management plan must replace conventional lecture/testing procedures.
2. The management plan must be based on an actual case study to insure that the student has confidence in his/her ability to perform in real rather than abstract situations. Students should have "hands-on" experience and on-site visit.
3. The course should provide experience in all practicums or basic skills required in the management process.
4. The ethics of decision making should be emphasized within the context of the producer culture.
5. Students should be exposed to the decision making process of faculty, producer-managers, service people and peers.
6. The course should substantiate the collaborative nature of decision making in agricultural systems rather than an independent, competitive process.
7. The integration of multiple disciplines must be apparent in management decisions.
8. The importance of good baseline data in the decision making process is important. This should not only stress the techniques but also develop the student's observational skills and interpretative logic.
9. The course must include the use of the basic skills in communication, mathematics, computer literacy and interpersonal relations. The process of management cannot be restricted to subject matter expertise.
10. Economics of decisions must be considered.
11. Student diversity in academic and experimental background should be considered.
12. Grading must recognize the attempt in synthesis rather than the final outcome. The individuality of the decision making process should be protected. Students should be allowed the freedom to be creative without the threat of grade impact.

Strategies of Course Development

Livestock Management on Range and Pasture has evolved over the years to meet the needs of the students and the changes in agriculture. Each component of the course is related to one or more of the characteristics defined for a synthesis course. Based on student evaluations this course has been very successful. The structure, philosophy and evolution of this course has served as a guideline for the development of similar courses.

Staffing

The course assumes that an integration of different professional disciplines can not be adequately achieved

by a single faculty member. The implication that one faculty member can adequately cover all aspects of ranch planning suggests that the process of synthesis is relatively simple. Since its origination the course has always had two faculty members assigned to it. Guest speakers with applied backgrounds are used to broaden students' perspectives. Students have the opportunity to hear several ranchers discuss their philosophy on ranching and the reasoning in their decision making. The credibility that non-faculty bring to the class as well as their personal commitment to its success is invaluable.

Format

A course structure had to be developed that would accommodate the diverse course objectives. This course is based on a two-part format which included a field session and an on-campus, semester-long lecture/discussion session. This format provided maximum flexibility in instruction. It was assumed that not all students would have the experience or prerequisite training in all disciplines. Curriculum structure does not often allow students the flexibility to develop coursework proficiency in related disciplines. Sequencing of prerequisites, total hour requirements for graduation, and the emphasis on the liberal education generally restricts student specialization to one area. While the strategy of a synthesis course should emphasize the integration of existing student knowledge, the reality suggests that all subject matter areas should be addressed.

The specific objectives of the field session are to provide training in vegetation survey, on-site case study visitation, exposure to ranching, ranch survey, decision making theory of producer, accumulation of a baseline data base for the management plan and refinement of observational skills. The on-campus lecture/discussion was designed to provide students with subject matter information, exposure to people in agriculture service, and assistance in the development of the ranch management plan.

Field Experience

Students must participate in a one-week field phase immediately preceding the fall semester. The expense of the field session is a consideration but the benefit of hands-on experience and on-site visitation makes it a necessity. A laboratory fee was implemented to alleviate the burden on departmental teaching budgets. The week is spent in the Nebraska Sandhills near Halsey, at the State 4-H Camp where lodging and dining facilities are available. The first session is designed for staff and students to become acquainted, explain the format for the week, discuss class objectives, and grading policy. A slide introduction on the Nebraska Sandhills is presented which includes an introduction to the philosophy of land stewardship and the ethics of "responsible" ranching.

Each student receives a three ring notebook which replaced a series of handouts and includes course objectives, daily schedules, all assignment due dates

for the semester, grading policy, text for topics to be discussed, and reading assignments. The notebook also contains suggested references and a glossary for students. The notebook was recently developed to provide more course structure and text for each subject. References and a glossary were important as the student population became more urban in background. Much of the evolution of this class since the mid 1970's is a response to the lack of rural experience in our students.

Each day during the field experience the activity planned is discussed in the classroom with minimal formal lecture prior to going to the field. All field work is structured to insure "hands-on" experience for each student. With two instructors and the volunteer assistance of a past student, much of the teaching is done in small groups. Observational skills are critical components of resource management; however, this skill can never adequately be taught in a conventional classroom setting. The ability to synthesize visual inputs into a logical analysis and management recommendation can only be developed under field situations. All field sessions emphasize the importance of observation in the field.

Field Techniques

Students learn how to identify at least 50 range plants and their value for domestic livestock. All training and testing is done in the field. This seems overwhelming to most students but the benefit of constant repetition in the field makes it an easily obtainable goal for students with no plant identification background. The number of plants has been reduced from 75 and the information that students must know about each plant was reduced. It is essential that the development of the basic skills such as plant identification be non-threatening to the novice. Students are quizzed at the end of the first day on plant identification; however, the scores are not counted towards their grade. In the past this first quiz did count towards the grade and put many students at a disadvantage. Currently this quiz is a training quiz used to make up survey teams based on their scores (high with low) as well as animal background versus plant background, rural versus urban. This procedure also emphasizes the collaborative learning expected in the course. The first plant identification quiz is flagged near the buildings and left as a training site for the remainder of the class. All field quizzes are given with carbon copy answer sheets so that students can grade their own progress as the quiz lines are reviewed. In the past quizzes were not graded in the field, but it is essential that feedback be immediate.

Students are also taught the basics of range survey: range site identification, range condition estimates and degree of use during the first 2 days. Range condition estimates and degree of use are much more art than science in application. It is very difficult to build confidence in the students' ability to visually estimate plant species composition by weight or degree of use.

Student anxiety was obvious when training was based solely on instructor estimates. Students now do a double sampling technique in which they make visual estimates and then clip vegetation to validate the estimate. This is repeated until students feel comfortable with their ability. The same procedure as been added to field exams.

On-site case study

On the second afternoon all teams are assigned pastures for the ranch survey and the entire class tours the ranch with the rancher. In the past a complete ranch tour was not conducted. As the course was designed, students did not see the entire ranch, and this was a disadvantage. It is essential that all students have first-hand knowledge of the entire ranch unit for which they are developing a management plan. This tour provides familiarization with the ranch and the rancher. This experience often provides the student with his/her first exposure to the ranching ethic and the sense of land stewardship. In the past student teams were not announced until the day of the ranch survey, and this was changed to the day of the ranch tour to encourage more interaction and familiarity.

Livestock management tour

A day is spent touring other ranches and a research ranch operated by the university (Gudmundsen Sandhills Laboratory) near Whitman, Nebraska. The main objective of the ranch and research station tour is to see and discuss systems of range livestock production. Traditional grazing and livestock management systems are visited as well as short duration-intensive grazing systems. Spring and fall calving ranches have been included. Each tour stop includes a question and answer discussion with the rancher which provides the student a unique insight into the ranch industry and its diversity. It also serves as a basis for his own management decisions in his/her ranch plan.

Ranch Survey

Student teams spend one day doing a range survey on pastures within the selected ranch. Day-long surveys are conducted to determine range site, species list, species composition, vigor, degree of use, physical facilities, problem areas and proposed renovation and a map for each pasture. This also enhances the observational skills of the student. In field sciences, it is the observational skills that are often neglected in traditional classroom settings. During the survey, students are also using a double sampling technique to improve their ability to estimate species composition by weight, a difficult skill to master. Thus the survey provides information for the entire class as well as training in survey techniques. One team will be assigned the ranch headquarters and will draw a detailed map and make a list of equipment to be shared with other class members. After a day in the field for the ranch survey, the ranch owner-operator has dinner with the class and answers their questions concerning his operation and ranch management. This session is

tape recorded for the students to review during the semester.

The ranch survey has evolved from a three day, complete ranch survey to a one day training session. The intent in the past was to survey the entire ranch condition. However, the difficulty in doing the survey estimates of ranch condition and degree of use warranted more emphasis on the training and less on complete coverage of the ranch. Pastures not surveyed by student teams are surveyed by instructors, and the information is provided to the class. The additional time accumulated by reducing the three-day ranch survey was allotted to field training and the tour of ranches.

Decision Making

The student must be exposed to the reasoning in the decision making of the producer-manager. The ranch tour has provided this exposure for the students. At each ranch stop, the producer spends time reviewing his management and answering student questions. At the rancher interview following the day of surveying, the rancher spends several hours reviewing his management and explaining the reasoning. This has been a recent addition and the audio taping has become a very valuable instructional tool.

Collaborative Learning

The field portion is invaluable in the development of a class community. The camaraderie and learning atmosphere that is developed is important and an essential component in the use of collaborative learning. Living together for one week minimizes barriers: student to faculty, graduate student to undergraduate student, range science students to animal science students, urban to rural students. It is an excellent method to develop the social and inter-personal skills that students will require in their profession. Many of the assignments involve group interaction with each group having a specific responsibility to the entire class such as providing range survey data for the various pastures in the ranch. Success is based on team-work and collaborative learning. The accuracy of any student's ranch plan is dependent on the baseline data collected by the class.

Classroom Activities Lecture Format

On-campus instruction was originally a 2 hour work session once a week, supervised by the assigned faculty, and the course was 2 credit hours. In the 1960's through mid-1970, the students generally had a rural background and the management plan stressed grazing and livestock management. The use of outside speakers was not consistent. As the student population became more diverse and the holistic approach to ranch management evolved, the course structure changed.

Currently, when students are back on campus in the traditional classroom setting, the use of guest speakers emphasizes the diversity in the decision making process. Additionally, the class now meets twice a week and more outside speakers are used to

provide subject matter expertise. Extension specialists and representatives of the Soil Conservation Service are invited speakers in their specialty area. Ranch economics have been incorporated into both lecture and plan. The classroom format is question and answer as opposed to conventional lecture. Discussion is focused on how different components of ranching interact. This often places the major responsibility for "lecture" content on the students through their questioning rather than prepared lectures by the speakers.

The Management Plan

The ranch plan is developed on campus during the semester, and the plan is divided in two parts. The first section is a description of the current operation based on the field survey and rancher interview. Students are encouraged to work together on this to develop a thorough description of the current management. Teams who worked together at Halsey are responsible for summarizing the data they collected and distributing the information to the rest of the class. Separate pasture maps and a ranch survey including pasture carrying capacities are summarized for the class. This provides an excellent foundation on which to base their management recommendations.

In the second part of the ranch plan, students have the opportunity to change any aspect of the current ranch and develop their own management plan. The development of the ranch plan is a very useful technique to integrate all aspects of the ranching enterprise. The fact that the students have actually been on the ranch as well as having the opportunity to visit with the rancher and other members of the ranching community makes the plan much more meaningful rather than abstract. This "real life" aspect does provide the student with a sense of confidence and competence in his/her abilities to actually make reasonable, meaningful management recommendations.

Development of the ranch plan (60% of the total grade) occurs at Lincoln with sections of the plan being due at specific dates throughout the semester. In the past the completed plan was submitted after about two-thirds of the semester, was graded, and returned for revision and then regraded. Due to student procrastination, sections are now required throughout the semester. Each section is discussed in detail during class time and worksheets (12% of the total grade) are provided to assist the student in accomplishing the assignment.

Several basic skills are incorporated into the ranch plan. Personal computers and existing software are used in ration formulation. A least cost series of rations based on available feeds on the ranch must be used in ration formulation. As stocking rates are increased, water supply and storage are considered with storage capacity calculated using algebraic equations to determine tank size. Oral communications are emphasized throughout the course with activities such as

the student interview of the cooperating rancher. The ranch plan is written in text form to encourage the use of writing skills. Writing should increase the learning efficiency while the plan serves to improve student literacy and competency in the language of the disciplines. The plan is written with the rancher as the intended audience.

Grading

Grading of the course involves examinations given during the field experience, grading of sections of the plan as they are completed, and an over-all grade assigned upon completion of the plan. Grading philosophy cannot follow traditional objective scales. It is not a reasonable expectation to expect "first-time" students to appreciate the complexities of management decisions and develop a perfect plan in all aspects. It is more important to acknowledge their effort in addressing difficult management decisions than it is to evaluate the absolute validity or practicality of their suggestions. Consequently, writing the plan is much closer to a learning tool than an evaluation tool. Grading is based more on the thoroughness of the attempt than accuracy of the content. Content errors are noted and suggestions made. This grading scheme encourages the student to be creative and innovative without the fear of grade impact. In support of this philosophy the student has the option to revise his plan based on instructor comments and resubmit. This process also serves to emphasize the developmental process of management plans.

Both instructors evaluate the ranch plan with attention given to spelling, grammar and clarity of writing. The best ranch plan(s) is (are) sent to the rancher at the end of the semester. Knowing that the rancher will read and possibly consider some of the student recommendations adds a sense of importance to plan preparation.

Grades are computerized with a print-out given to each student after each additional grade input. The print-out includes grades by assignment, average to date and rank in class. Part of the grading philosophy includes no grade for late papers. This has been adopted to impress upon students the value of responsibility to meet deadlines. It fulfills part of the "real world" training that many students overlook. The demands of the course and the deadline policy force the student to prioritize activities and become proficient in time management both of which are both characteristics of successful ranchers.

Summary

Livestock Management on Range and Pasture is a team-taught, synthesis course involving both field and classroom work. Expertise is provided by individuals from subject matter areas related to holistic management of cattle on range and pasture. Instructors continually emphasize the interrelationships of the various fields of study and disciplines involved. The management plan developed by each student requires integration of information and synthesis of a workable plan for livestock and range management on a

Nebraska Sandhills ranch. The format of this course has been used as a model for course development or revision at other universities.

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Computer-Assisted Plant Identification Tests

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Knowledge of plants and how they are propagated is one of the objectives of a course in plant propagation. To meet this objective, students in my plant propagation course are required to identify a group of 115 plants including annuals, perennials, shrubs, vines, and trees. Potted specimens are maintained in the greenhouse and accurately labeled for genus, species, variety or cultivar, and family. Each week students are provided with a study list containing the genus, species, family name and the commercial method of propagation for each of 15 plants. Students have access to the greenhouse for plant study and must learn to identify assigned plants and their commercial method of propagation. Correct spelling of scientific and family names is also required.

1985 Plant Test Procedure

Beginning the third week of class a weekly plant quiz was scheduled. Ten numbered plants, from previously assigned lists, were placed in the laboratory and a student could take the plant quiz on a designated day at a time of his or her convenience. The quiz consisted of writing the correct scientific name, family name, and commercial method of propagation for each test plant. Upon completion, the student's test paper was manually graded and assigned a preliminary performance score. All quizzes were retained, checked for errors, assigned a final grade, and returned the following Monday. This testing procedure was time consuming, labor intensive, and cumbersome.

1986-1987 Test Procedure

During 1985, a computer program written in GW-Basic was developed to assist in the testing procedure (2). It was introduced to the class in 1986 during the first laboratory period. About an hour and a half of instruction was devoted to computer operation and use

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