(1987), Krockover et al (1987) and others.

We suggest that, at least for horticulture classes at Montana State University, the present system of requiring prerequisites be re-evaluated. This study suggests that prerequisites for some courses in the horticulture curriculum may be unnecessary in preparing students for satisfactory performance in upper level courses. Assuming there is still some value, however, to a vertical integration of courses, we suggest that those courses now listed as "prerequisite" be redesignated as "recommended" and students strongly urged, but not required, to take them. A question that might be asked correlative to this study is "Why are prerequisites not serving the desired purpose of boosting grades?" Have we overly simplified prerequisite courses, or have we diluted our primary courses to the point where vertical course integration is no longer necessary? An indepth historical study which reviews the same courses over a very long time where course content and rigor have changed should aid in determining whether our courses have been diluted.

Literature Cited

Doctor, R.1996. Reading prerequisites and success in general education courses. Michigan Community College Jour.: Research & Practice 2(2):25-34.

Englander, L. Department of Plant Sciences, University of Rhode Island, Kingston, RI (personal communication)

Fourteenth Course Catalog. 1906-1907. Montana State College, Bozeman, MT.

Golembiewski, R. Department of Plant, Soil, and Environmental Sciences. Montana State University. Bozeman, MT (personal communication)

Nineteenth Course Catalog. 1911-1912. Montana State College, Bozeman, MT.

Kangas, J. 1989. How many students do not meet prerequisites for San Jose/Evergreen Community College courses? San Jose/Evergreen Community College Research Report #77.

Krockover, G.H., H. Mortlock, and B.T. Johnson. 1987. Comparing success predictors and the common core course performance. Action in Teacher Education 9 (1):61-65.

Martin, M.A.1989. Course prerequisites and undergraduate student performance. NACTA Jour. 33(1):38-42.

Lane, B. Department of Horticulture. North Carolina State University, Raleigh, NC (personal communication)

Parker, R. Department of Agriculture. College of Southern Idaho, Twin Falls, ID (personal communication)

Royer, J.M., W.A. Abranovic, and G.M. Sinatra. 1987. Using entering reading comprehension performance as a predictor of performance in college classes. Jour. Educ. Psychology 79 (1): 19-26.

Von Allman, P.1996. The effect of quantitative prerequisites on performance in intermediate microeconomics. Jour. Educ. for Business 72(1):18-22.

Machinery Management for Agro-Ecosystems: A Non-Traditional Approach to a Traditional Topic

Timothy N. Burcham[1], Agricultural and Biological Engineering
Matt R. Raven[2], Agricultural Education and Experimental Statistics
Mississippi State University
Mississippi State, MS 39762

Abstract

A traditional agricultural machinery management course was restructured to meet the needs of traditional and non-traditional students in the College of Agriculture and Life Sciences at Mississippi State University. The new course embraced the basic principles of a traditional agricultural machinery management course while applying them to a broader audience. Prominent components included using computers as a problem solving tool, incorporating a class Web site for enhanced instruction, using MS PowerPoint presentations in lecture, and using hands-on problem-based laboratory exercises. The new course has been taught three times with an average enrollment of 17 students. This is three times the average enrollment for the previous eight-year period. Student Evaluation of Teaching written comments and category ratings have been exceptional with an average score of over 4

[1] Assistant Professor
[2] Associate Professor

on a scale of 5 for all categories. The restructuring efforts revitalized a dated machinery management course and allowed machinery management principles to be delivered to a more diverse audience.

Introduction

Machinery Management Perspectives

Today's agricultural marketplace is very competitive and machinery costs continue to be a significant component of the total costs associated with crop production. These costs include both fixed capital outlays as well as variable costs associated with machinery operation. For example, an average cotton producer in Mississippi, Texas, or California can easily have several million dollars invested in cotton pickers alone and that is just the harvesting aspect of the production system. Costs of this magnitude require agricultural producers to be efficient managers of machinery resources. Therefore, it is not surprising that agricultural machinery management courses are commonly taught in most post-secondary agricultural programs in the United States.

Green-industries, like mechanized production agriculture, depend on a host of specialized machinery to maintain the playability and aesthetic beauty of golf courses and other recreational turf surfaces. Unlike agricultural production machinery that typically has seasonal usage, most turf-based machinery is used on a daily basis. The ability of green-industry professionals to maintain these areas is largely dependent on turf-based machinery. Thus, knowledge of machinery management principles such as machine life, replacement costs, depreciation, and field performance is essential for today's "machinery dependent industries" (Durkin, 1996). Mechanized agriculture, golf course management, and landscape contracting are all prominent examples of "machinery dependent industries."

Unfortunately, many post-secondary educational programs have failed to recognize the need for green-industry professionals to gain this knowledge base through a machinery management course. As a result, these professionals enter the work place with minimal machinery management competencies.

Demand for Graduates

The golf and turf industries have experienced tremendous growth in recent years. Extension economists estimate that in 1997 the Mississippi green-industry will be worth between 250 to 500 million dollars (Coblentz, 1997). From 1985 to 1993 the Mississippi green-industry was estimated to have grown by 17 percent. With approximately 15,000 golf courses in the U.S. (2,000 courses constructed in the past decade), the demand for green-industry professionals will continue strong for the foreseeable future (Snow, 1996; Stoner, 1996). The demand for university-educated professionals specializing in green-industry related majors such as landscape contracting and turfgrass management is at or near an all time high (Goatley, 1997). For example, there are currently over 100 students enrolled in the Golf and Sports Turf Management curriculum at Mississippi State University (MSU). The Professional Golf Management program has a current enrollment of approximately 178 students (Professional Golf Management, 1997). Similar programs are flourishing at other universities throughout the U.S.

Statement of Need

For those individuals in majors involving agricultural production, a course in machinery management is rarely questioned. Established agricultural mechanization programs typically offer a course in agricultural machinery management. Due to the traditional production agriculture theme of these courses, they are not widely attractive to green-industry majors. Thus, in their current form, standard agricultural machinery management courses do not meet the machinery management educational needs of turfgrass and other green-industry majors.

Methods

The authors were assigned the Agricultural Machinery Management (ABE 4163) course in the fall of 1994. An inspection of enrollment records revealed that Agricultural Engineering Technology and Business (AETB) majors historically attended the course. Further inspection of departmental records revealed a poor overall enrollment in the course for the past 11 years (Fig. 1). The course was not offered in 1987 and 1989 due to insufficient enrollment. These observations indicated that the machinery management needs of students throughout the College of Agriculture and Life Sciences were not being met by the existing course. This prompted a restructuring of the course to appeal to a broader range of students including non-traditional agriculture majors.

The first step, prior to any course restructuring, was to poll the various departments within the College of Agriculture and Life Sciences to determine educational needs in the area of machinery management. The response was very encouraging. In particular, faculty from the areas of turfgrass management and landscape contracting indicated a strong desire for their students to complete a course in machinery management.

Thus, two compelling factors led the authors to restructure the traditional Agricultural Machinery Manage-

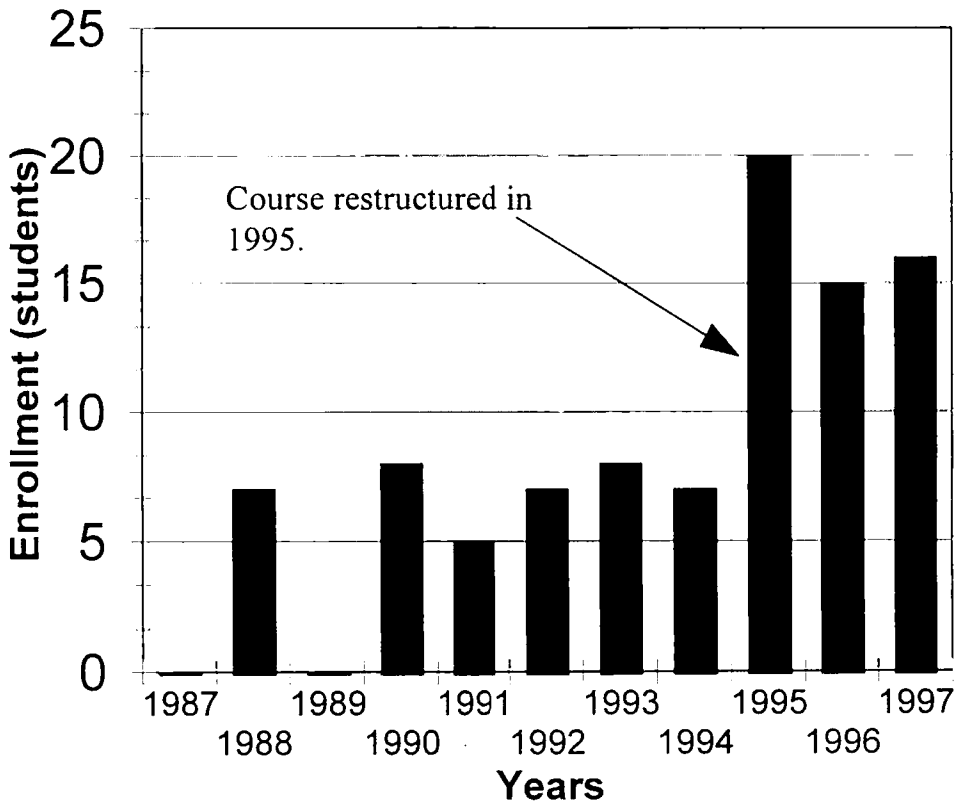

Figure 1. Total enrollment in ABE 4163 (course titles: Agricultural Machinery Management 1987 – 1994 and Machinery Management for Agro-Ecosystems 1995 - 1997).

ment course (ABE 4163) in a manner that would also be inclusive of the needs of non-traditional agricultural majors. First and foremost, a distinct need was voiced from non-traditional agricultural majors (turfgrass and landscape contracting) to complete a college-level course in machinery management. Second, the existing AETB enrollment (even though it is currently increasing) was insufficient to offer ABE 4163 on a regular basis. The decision was made to invest the resources available to offer a restructured ABE 4163 that would satisfy the needs of both traditional and non-traditional agriculture majors.

An assessment of available resources was needed to determine the feasibility of offering a restructured machinery management course that included turf-based machinery as well as standard agricultural machinery. The university owns and operates a PGA-approved 18-hole golf course. The golf course is equipped with the latest turf-related machinery and the university affiliation allows the course to be used as a teaching laboratory. Full cooperation from the golf course superintendent facilitated open access to the teaching classroom and all turf-related machinery as necessary for implementation of the laboratory exercises.

Results

The development of the new machinery management course was a team effort that included faculty from the departments of Agricultural & Biological Engineering, Agricultural Education & Experimental Statistics, Plant & Soil Sciences, and MSU Campus Landscape.

The Course Title

The primary goal was to make the new course more inclusive of non-traditional agriculture majors. Thus, the existing course name (Agricultural Machinery Management) needed to be changed. The decision was made to title the new course "Machinery Management for Agro-Ecosystems". The combined term "Agro-Ecosystems" served to expand the scope of machinery application to non-traditional agricultural crops such as turfgrass. The course description in the MSU bulletin was also changed to illustrate this distinction between the old and new course. The course description for Machinery Management for Agro-Ecosystems as it appears in the current MSU bulletin reads:

ABE 4163/6163. Machinery Management for Agro-Ecosystems. (3) (Prerequisites: ABE 1863 or equivalent, junior standing and/or consent of the instructor). Two lectures. Two hours laboratory. Basic principles of operation and management of agricultural, landscape, and turf power machinery; selection of machinery based on power requirements, economy, and suitability for Agro-Ecosystems.

Lecture Content

Because the principles of machinery management are universally applicable to all organizations operating mechanical equipment, the basic topics of an agricultural machinery management course are generally applicable for the new course. As such, the larger components of the lecture outline were similar to the previous Agricultural Machinery Management course. The subject outline for the new course is as follows:

1. Introduction to Machinery Management
2. Machinery Records and Maintenance Scheduling
3. Measuring Machine Capacity
4. Matching Machine Size and Capacity
5. Estimating Fixed Costs
6. Estimating Variable Costs
7. Total Costs for Machines and Operation
8. Deciding When to Trade
   - Present Value Analysis
   - Comparing Machines with Unequal Life
9. Comparing Ownership, Leasing, and Rental Costs
10. Power & Drive-Train Systems
11. Human Aspects of Machinery Management

The most obvious change in the lecture format was the inclusion of green-industry examples and problem scenarios. Real-world machinery management examples were consciously alternated between traditional and non-traditional agriculture. Since the new course attracts students from different majors, the thrust of the lecture period was toward basic machinery management concepts. When these concepts were discussed, examples and parallels were provided to relate the topic to each respective major.

Machinery costs are a significant component in the production of an agronomic crop and as such, the financial component of the new machinery management course was extensively revised and upgraded to include computations involving present value analysis. This component of the course included amortization schedules, comparison of machines with unequal life, and time value of money computations. Spreadsheets were incorporated extensively for the financial segment of the course.

Another important addition to the new course was the usage of Microsoft PowerPoint slides to display lecture outlines in the classroom. This type of visual outline is easy for students to follow and encourages the instructor to deliver lectures in an organized manner. In addition, these presentations can be printed to an Adobe Acrobat file and easily displayed on the class Web site. This allows students to review class lectures for exams.

Lecture periods were conducted in an open format with participation invited from the students. This open interaction allowed the students to express their real-world observations with regard to the theories being discussed in class.

ABE 4163/6163 Web Site

The use of computers as a tool for the management of machinery resources (machinery in this case) was stressed in the new course. The need for computer competency is essential for graduates. The authors felt that this was best accomplished by using computers to teach rather than teaching about computers. While the new machinery management course was not designed to provide all the computer competencies that an undergraduate should receive, the authors devoted significant effort in demonstrating the effective use of computers as a management tool.

To drive this concept home, an ABE 4163 Web site was created. The class Web site has a two-fold objective: (1) to encourage students with little or no computer background to gain skills with regard to interacting on the Internet and (2) to show by example how computers can be used as a tool for accessing, analyzing, and applying information to solve problems. The class Web site includes course details, assignments, lecture notes (HTML or MS PowerPoint format), laboratory exercises, links to instructors' email, and digital pictures (with email address) of students in the class. Requiring students to routinely access important information from the class Web site helped them to become more at ease with the computer and other resources available on the Internet. A number of students made positive comments about the integration of computers into the course on their Student Evaluation of Teaching (SET) forms.

Lab Content

The authors felt strongly that the laboratory segment should be the cornerstone of the new course. The primary goal for the laboratory segment of the course was to

provide a learning experience that demonstrated real-world application of machinery management concepts. In order to facilitate this goal, the lab component of the course was completely revised. The new labs were designed to link theories and concepts taught in lecture.

The new machinery management laboratories were conducted in a university computer laboratory or at the MSU Golf Course. While computer applications were stressed in all segments of the new course, computer-based laboratory exercises were given a prominent role in the new laboratory structure. Computer skills were introduced in a problem-based manner, such that students understood the computer's role as a "tool" for problem-solving, record keeping, and decision making. Students were required to complete assignments that utilized email, file transfer, spreadsheet construction, word-processing, and navigating the World Wide Web.

Laboratories conducted at the MSU golf course focused on technical competencies and problem-based learning scenarios. Technical skills taught included sprayer calibration, spreader calibration, and an introduction to engines and power trains. Problem-scenarios were designed to demonstrate the concepts and principles taught during the lecture period. Additionally, these problem-based learning scenarios encouraged students to seek solutions that integrated their computer skills.

A multi-lab series addressing theoretical and field efficiency of machines illustrated how concepts taught in lecture were reinforced with hands on experience. In this lab sequence, students recorded necessary measurements to compute the theoretical and field capacity of a conventional lawn tractor and a zero-turn radius lawn mower. The incorporation of the zero-turn radius mower allowed the students to see first-hand how unproductive-time used in turning and unnecessary maneuvering affects actual field capacity. Measurements were then processed and analyzed using spreadsheets. These labs allow the student to participate in all phases of the problem solving process and provide a road-map for future problem solving tasks.

One of the most satisfying aspects of incorporating turf-based machinery into the laboratory exercises is the accessibility this type of equipment affords students in a laboratory setting. Since most turf-based machinery is smaller than its agricultural counterparts, students with little or no machinery experience feel much less intimidated when operating machinery for laboratory exercises. Because turf machinery is used virtually every day, it is typically in top operational condition. This cannot be said of some types of agricultural machinery, particularly machines that see seasonal usage (combines, planters, haying equipment, etc.). Using turf-based machinery versus agricultural machinery for standard computations such as field efficiency is strictly a matter of scale. Since a golf course typically has multiple mowers used for the same task, the class can be subdivided allowing each student the opportunity to have an active part in the lab exercise.

Evaluation

The revised course has been taught three times. The enrollment has been encouraging, averaging 17 students per semester. This compares favorably to the previous eight-year enrollment average of five students per semester. Thus, average attendance has more than tripled. Students from AETB, Golf & Sports Turf Management, Landscape Contracting & Management, and Agricultural Education & Experimental Statistics have taken the revised course.

Data from the Student Evaluation of Teaching (SET) forms have also been encouraging. The ratings on all areas of the SET form have consistently been above 4 on a scale of 5. Particularly rewarding have been the ratings on relevance to the students' course of study. The rating on this area has averaged 4.5 (on a scale of 5) for the three times the revised course has been taught. The most illuminating evaluation of the course has been the written comments, which have been overwhelmingly positive. These comments provide an indication that the primary objective of the new course is being achieved.

Summary

The authors were assigned an agricultural machinery management course in 1994 that no longer satisfied the needs of many students in the College of Agriculture and Life Sciences at MSU. Rather than letting the course continue as a 1960s offering, the authors restructured it to meet the current needs of students in traditional (production) and non-traditional (green-industry) agriculture majors. While the various topics associated with a traditional agricultural machinery management course were retained, their presentation in lecture and laboratory periods were completely restructured. Prominent components in the new course included using the computer as a problem solution tool, incorporating a class Web site, introducing PowerPoint lecture presentations, and extensive use of hands-on problem-based laboratory exercises. An effort was made to present class information such that students with various learning styles were not intimidated. Teamwork was stressed during all laboratory and group assignments.

The concepts of machinery management are essential for professionals competing in "machinery dependent industries" (production agriculture, building construction, sports & turfgrass management, golf course

management, and landscape contracting). These managers will ultimately be charged with purchasing, maintaining, and selling machinery that is required for their industry to function. These decisions should be based on proven economic evaluations and machine performance criteria, not emotional buying whims. A well designed machinery management course can embrace all of the basic principles of a traditional agricultural machinery management course, while applying them to a broader audience. The inclusion of non-traditional agriculture majors is healthy for the course (enrollment stability), and is ultimately healthy for the industries that hire graduates from colleges of agriculture.

The restructuring efforts revitalized a languishing and dated machinery management course. It is hoped that these efforts will serve as a model for other colleges of agriculture with similar physical and instructional resources.

Literature Cited

Coblentz, Bonnie. 1997. Mississippi Agricultural News: Green industry has growers cashing in. WWW, http://saturn.msstate.edu/~infonews/news/agnews/970106dt.htm. Jan. 6.

Durkin, Kathleen. 1996. Maintenance costs can be managed, or so I've read. WWW. http://www.sramarketing.com/sra/turfmaintenance/Articles/Costs.html. Oct. 28.

Goatley, James M. 1997. Associate Agronomist, Plant & Soil Sciences, Mississippi State University. Personal communication. June.

Professional Golf Management. 1997. College of Business and Industry, Mississippi State University. Personal communication with administrative staff. June.

Snow, James T. 1996. An overview of USGA environmental research. WWW. http://www.usga.org/green/envres.html. Feb. 21.

Stoner, Parker. 1996. Turf industry job growth increases need for information. WWW, http://www.sramarketing.com/sra/turfmaintenance/Articles/TurfInd.html. April 22.

Personality Types of Golf Course Superintendents and Students Graduating in Turfgrass Management

David Willoughby[1] and Allen Zimmerman[2, 3]
The Ohio State University, Wooster Campus
Agricultural Technical Institute, Wooster, OH 44691-4000

Abstract

The predominant personality types in a population of golf course superintendents were found to differ significantly for some preferences when compared to a general population of college graduates. The personality types of graduates from a turfgrass management program at a technical college were found to be similar to those for the population of students who enroll at the college. However, there was a significant difference for some preferences when the turfgrass management graduates were compared to the golf course superintendents.

The typical golf course superintendent in the population surveyed was found to be a 39-year-old male with an associate or bachelors degree. This individual had been employed in the occupation for 18 years, worked 41 or more hours per week, and rated job satisfaction as high.

Introduction

An understanding of personality types can be very helpful to students attending college in such areas as improving study skills, developing interpersonal skills, setting goals, and learning to appreciate personality differences and diversity. Therefore, the topic of personality types is included in a required orientation course at The Ohio State University Agricultural Technical Institute (Ohio State ATI), an associate degree technical college with an enrollment of about 800 students. The Myers-Briggs Type Indicator® (MBTI)[4] is used as the vehicle for helping students learn about personality types. It has been administered on a voluntary basis to incoming Ohio State ATI students since 1991. Students are given their results during an orientation class period devoted to the topic of personality types.

Understanding the concept of personality types has value beyond the campus. As an example, it has been well documented (Myers et al., 1985) that personality types have an important affect on the occupational preferences of individuals. Individuals differ in the way they like to think and work, and are naturally drawn to occupations that interest, motivate and satisfy them. As a consequence, although individuals with a variety of personality types will

[1] Assistant Professor

[2] Associate Professor

[3]The authors wish to acknowledge Nancy's Brooker's assistance with MBTI material.

[4] ® Myers-Briggs Type Indicator and MBTI are registered trademarks of Consulting Psychologists Press, Palo Alto, CA.