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TEACHING A HARDWOOD SILVICULTURE AND MANAGEMENT COURSE: EXPERIENCE AND IDEAS INCLUDING USING BLACKBOARD® WEB-BASED COURSEWARE

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ABSTRACT: FOR 4033: “Silviculture and Management of Hardwoods” is an optional, senior-level course taught in the School of Renewable Natural Resources at Louisiana State University. The primary goal of this course is to make students more knowledgeable and appreciative of hardwood resources. A secondary goal is to make students as competitive as possible for all hardwood employment opportunities. These goals are accomplished by assisting students in learning various aspects of the ecology, silviculture, and management of hardwood ecosystems. This knowledge is then integrated into a silviculture plan for a non-industrial private forest landowner based on his or her ownership objectives. Emphasis is placed on timber utilization, wildlife habitats, and recreation in bottomland hardwood ecosystems given the abundance of this resource in Louisiana and the southern United States.

A variety of teaching techniques are utilized in this course including classroom environment preparation, student participation, laboratory demonstration with hands-on learning, a weekend field trip, and team-oriented commu-

nication with a non-industrial private forest landowner. A recent addition to the teaching environment is the utilization of Blackboard®. Blackboard® is a Web-based teaching platform that allows an instructor to organize and deliver course materials for easy access by students. Blackboard® has enabled me to present more information regarding the ecology, silviculture, and management of hardwoods in a more-effective format. Student reception of the Blackboard® program after one year of use has been excellent although challenges do exist.

INTRODUCTION

Southern United States forest resource programs have traditionally emphasized pine silviculture and management in the curriculum over hardwood silviculture and management. A review of past silviculture course syllabi and a search of the World Wide Web of many Society of American Foresters accredited southern forest resource programs proves this point. Emphasis on pine species is justified given the importance of pine in providing the nation's need for wood products. A trickle-down effect has resulted in more employment opportunities for students trained in pine forest management with an emphasis on timber objectives.

Hardwood silviculture and management is gaining in emphasis in southern forest resource programs. Increased public interest in diversity of forest resources, especially on public lands, and increasing market opportunities for hardwood resources is leading to more emphasis on hardwoods in college curricula. Increased hardwood emphasis has occurred primarily in the general silviculture courses since silvicultural principles can be taught across a variety of forest cover types. Unfortunately, few courses exist specific to hardwood silviculture and management, especially at the undergraduate level. The lack of specific hardwood education training at the collegiate level has led to an increase in the number of continuing education courses focusing on hardwoods, most notable of these are the series of five hardwood short courses offered by the College of Forest Resources at Mississippi State University.

Justification for a course specific to hardwood silviculture and management in the southern United States can be based on the vast hardwood resources that exist today. In Louisiana, forests cover 13.8 million acres, or 52 percent of the land (Vissage et al., 1992). Bottomland hardwood forest cover types (oak-gum-cypress and elm-ash-cottonwood) comprise 34 percent of the forested acreage and, when combined with the upland hardwood-dominated types (oak-hickory and oak-pine), give hardwoods about 63 percent of the forested acreage. Furthermore, non-industrial private forest landowners own 70 percent of this hardwood resource (Vissage et al., 1992). Finally, using 1998 severance tax collection data, about 1.2 billion board feet of pine was harvested in Louisiana compared with only 220 million board feet of hardwood (statistics provided by the Louisiana Office of Forestry, Web site: <<http://www.ldaf.state.la.us/forestry>>). The point to these statistics and additional personal observations is that Louisiana has a considerable hardwood resource that, for the most part, is relatively unmanaged. These statistics point to tremendous hardwood management opportunities. I believe similar opportunities exist across most of the southern United States.

An optional undergraduate-level hardwood course has been taught within the School of Renewable Natural Resources at Louisiana State University for many years. The course was taught periodically when student demand justified the need for the course in a given year. Prior to the Spring 2000 semester, the course was taught seven times over a 20-year period (twice in the last nine years). Since then, the course has met each of the past two spring semesters and is currently being taught this spring semester. Increased interest in this course has been due partly to the increased interest in hardwoods as mentioned above. Another reason for the increased interest in the course has been an emphasis on the ecological understanding needed to manage hardwood resources and an emphasis on a variety of management objectives, including wildlife habitat and recreation, in addition to timber. During the Spring 2001 semester, changes were made in the course to coincide with the availability of Blackboard® courseware. In this paper, I will review the format and various teaching tools used in FOR 4033 (soon to be RNR 4033) "Silviculture and Management of Hardwoods." I will also show how I have incorporated the Blackboard® courseware in the conduct of the course.

COURSE FORMAT

Course Description

The course description for FOR 4033: “Silviculture and Management of Hardwoods” involves the ecology, silviculture, and management of hardwood forests and ecosystems including the improvement, conservation, and use for forest products, wildlife habitats, and other amenities. The course, as currently taught, involves two hours of lecture and three hours of laboratory per week for a typical 14-15 week semester. Starting with the Spring 2003 semester, the number of lecture hours will increase to three per week. In addition to weekly laboratories, a weekend field trip is required to observe hardwood practices not commonly found in the southern Louisiana area. Prerequisites include courses in dendrology and silviculture although I do allow students to enroll who do not have these prerequisites on the condition that they do extra preparation both before the semester and during the conduct of the course.

Course Objectives

The goal of this course is to make students more knowledgeable and appreciative of hardwood resources. A secondary goal is to make students as competitive as possible for all hardwood employment opportunities. These goals are accomplished through a series of lectures and laboratories designed for students to gain additional experience in the ecology, silviculture, and management of bottomland and upland hardwood ecosystems with an emphasis on bottomland hardwoods. These goals are further accomplished by explaining aspects of hardwood ecology and its importance to silviculture and management. Application of new management philosophies and techniques for managing hardwood ecosystems are used in both lecture and laboratory and integrated into a hardwood silviculture project. The course also incorporates ample opportunities for students to practice their written and oral presentation skills and to obtain a set of readings that will be of benefit not only in this course but in their future career should it involve hardwood management.

Classroom Environment

To encourage active participation by students I incorporate several techniques in my lecture preparation. First, I encourage students to ask questions and discuss observations made from readings, lecture materials, and laboratory experiences. One of my teaching philosophies has been to trade some lecture time for good discussion of lecture or related topics. I constantly challenge students regarding concepts presented in lecture. For example, when discussing the benefits of low thinning versus high thinning in hardwoods, I often will select a student and ask which method is best. I further probe the student to justify his or her answer and then ask other students whether they agree or disagree. With relatively small class sizes (10-18 students), I have found most students will become active participants in the class. I further ensure active participation by arranging the desks in a semi-circle pattern; i.e., I do not allow students to hide behind other students. Students that do not speak much are targeted to answer specific questions until they become comfortable with participating in class.

Lecture Format

Lectures in FOR 4033 are divided into four sections: Introduction, Ecology, Silviculture, and Management. Specific lectures in the Introduction Section frame the next three sections and review information students received in previous courses. Introduction Section lectures include a review of ten perspectives for good bottomland hardwood management (see Web site: <<http://fwf.lsu.edu/lockhart>>), a review of basic disturbance ecology, succession, and stand development, an overview of basic silvicultural terms and practices, and a review of hardwood resources both across the eastern United States and statistics specific to Louisiana.

Lectures in the Ecology Section range from ecophysiology and autecology to ecosystem and landscape ecology levels with an emphasis at the stand level. Specific lectures include forested wetland functions and values (a particularly important topic to southern Louisiana), species, site, and species-site relationships, hardwood seed biology and ecology, hardwood seedling ecology and ecophysiology, stratified-mixture concepts, stand development, and old growth. Particular attention is given to stand development since these concepts are used frequently throughout the course. Much of the literature used in the stand development lectures is based on work done with upland hardwoods in the north-central and northeastern United States; therefore, students receive good exposure to other hardwood forest cover types not found in the West Gulf Coastal Plain.

Silviculture Section lectures follow the logical flow of silvicultural practices (Figure 1). I begin with the reproduction methods with an emphasis on even-aged practices since information on uneven- uneven-aged methods in hardwoods lags far behind the even-aged methods, both in research, experience, and confidence in implementation. I have also added additional lecture time to the two-aged method, as it is becoming a popular method for regenerating hardwoods, both on public and private lands. Emphasis during the intermediate treatment lectures focuses on partial cutting, particularly improvement cutting and thinning, as these are the most common intermediate practices in hardwood management today. It is here that the major difference between hardwood management and pine management becomes evident. Many quantitative tools, such as stand density indices and computer models using growth and yield projections, are available for pine instruction. Such tools are basically nonexistent for bottomland hardwood instruction. Various qualitative tools and general rule-of-thumb ideas are used in hardwood management and subsequent instruction. Less time is spent on other intermediate treatments such as release, fertilization, and pruning as these treatments are practiced less commonly in southern hardwood management, less information is available in the published literature, and I am still in the process of synthesizing upland hardwood literature on these topics.

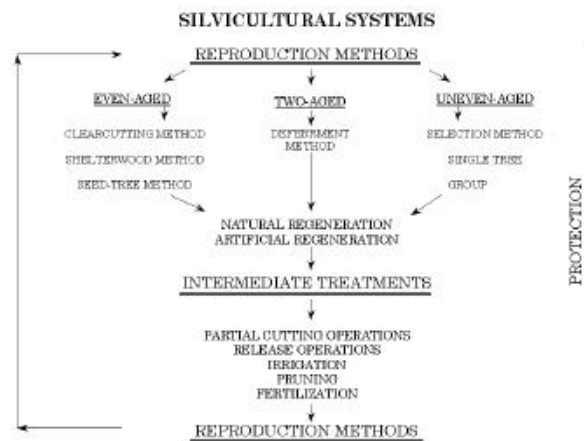


Figure 1. A Flowchart for Teaching Silviculture

The Management Section lectures begin with a review of a management decision flowchart that is still evolving. I then proceed through the various qualitative tools used in hardwood management including site evaluation using the Baker/Broadfoot Method (Baker and Broadfoot, 1979), hardwood regeneration evaluation (Johnson, 1980; Hart et al., 1995; Belli et al., 1999), and log grading (Kenna, 1994). All of the materials covered in class up to this point are then integrated into the tree class lecture. In short, the tree class system involves the development of a species classification, crown classification as modified for hardwoods (Meadows et al., 2001), and log grades to develop a set of marking priorities for hardwood management (Putnam et al., 1960; Meadows, 1996). Tree classes are developed to meet designated management objectives, whether they be timber, habitat for specific wildlife species (game or nongame), growing wild flowers, etc. A hardwood decision-making model is then

used to help students acquaint themselves with the first decision they will face in managing a hardwood stand—to continue to manage the stand or start efforts to regenerate the stand (Manuel et al., 1993). Additional management lectures, time permitting, focus on more specific aspects of bottomland hardwood management issues, e.g., afforestation in the Mississippi Alluvial Plain and specific wildlife habitat improvement such as snag retention and green-tree reservoirs.

While the ideal lecture schedule would follow the logical order of the four sections stated above, I have found it necessary to incorporate many of the management lectures during the first two-thirds of the semester. Students are required to develop a silviculture plan (discussed below). For them to have some of the management tools needed to work on this plan (e.g., site evaluation and regeneration evaluation), it is necessary that lectures specific to these tools be given to students earlier in the semester.

Readings

I do not require a textbook for FOR 4033 since none are available that cover the broad approach used in the ecology, silviculture, and management of hardwoods. Several reference books used include Putnam (1951), Putnam et al. (1960), Walker and Watterson (1972), Kellison et al. (1981), Hicks (1998), and Messina and Conner (1998). Additional information is taken from the U.S. Forest Service's *Northern Hardwood Notes* and *Central Hardwood Notes* in addition to the many published papers on hardwoods.

I divide readings into two types: required and sources of additional information. Required readings are expected to be read before coverage of the related topic in lecture. Information from required readings is also expected to be used in written assignments, the silviculture project, and examinations. Sources of additional information readings are for students interested in more information on specific topics. Information from additional readings used in assignments, the hardwood silviculture project, and examinations are given extra consideration during grading, especially if cited.

I usually provide the readings as scanned pdf files to the students through Blackboard[®], similar to Baker (2000). Since the Web site is password protected to only those students enrolled in FOR 4033, I consider providing readings as pdf files the same as online reserves.

Laboratory Format

Typically, 10 of 13 scheduled laboratory periods are outdoors. These laboratories are designed to enhance student experiences (especially field experiences) in the ecology, silviculture, and management of hardwoods. Laboratory experiences range from identifying species-site relationships with minor changes in elevation along a floodplain transect and how differences in deposition, soil texture, and moisture-holding capacity are reflected in species changes with different site elevations. Other laboratory exercises include site-quality determination with an emphasis on soils and site characteristics, hardwood regeneration evaluation, crown classification determination using a recently-developed point system based on crown position and condition (Meadows et al., 2001), and log grade evaluation. Several laboratories involve tours with various organizations that work in hardwood management and/or hardwood-related issues. Tours include on-site visits with forest products companies, national wildlife refuges, the Louisiana Department of Wildlife and Fisheries, and the Louisiana Field Office of The Nature Conservancy.

One particularly noteworthy laboratory exercise is the stand development laboratory. This laboratory exercise involves two laboratory periods. In the first laboratory period, the students and I discuss stratified bottomland hardwood stands while in the woods. Questions revolve around clues that indicate stand history in addition to species composition. A specific oak tree, previously identified in laboratory preparation, is then discussed regarding possible development history and relationships to neighboring competitor trees both in the overstory and understory. This tree is then designated as a plot center tree (a “crop” tree) and students conduct various

measurements of tree size and distance to possible competitors. We then harvest the crop tree and all neighbors with adjacent crowns in the overstory and all trees directly underneath the crop tree. Tree discs are cut at three-foot intervals along the length of each tree and an additional disc is taken at d.b.h (diameter at breast height, 4.5 feet). These discs are taken back to the research laboratory for further analyses. In the second laboratory period, students employ several techniques for determining the age of each disc. The laboratory assignment is then created and involves the development of height-age graphs. In most cases, students find that the crop tree (usually the largest tree we harvest) is similar in age to the other trees, including the small trees in the understory. Also, students discover that early in stand development, the smaller trees were usually taller than crop tree. It is here that lectures on stand development are tied to the actual development of the crop tree. In one example, students measured a central water oak (*Quercus nigra* L.) as 11 inches d.b.h., 66 feet tall, and 42 years old. Two adjacent mockernut hickory (*Carya tomentosa* (Poir.) Nutt.) trees, one two inches d.b.h. and the other one inch d.b.h. and both around 15 feet tall, had similar ages, 41 and 43 years old, respectively. It has been amazing to watch students realize that different sizes in trees does not necessarily indicate different tree ages, especially in mixed-species stratified hardwood stands.

Quizzes

I assign a reading/lecture quiz each week except during weeks when an examination is scheduled. Quizzes are given on Wednesday (through Blackboard[®]) and due the following Monday before class. Quizzes typically contain three to five questions relating to the previous week's lectures and laboratory and lecture materials to be presented during the next week. Giving questions related to the lecture material to be presented the next week is particularly important as it is one way to ensure that students read assigned material before coverage in lecture.

Potential quiz questions for each lecture are available in separate pdf files and are available to students through Blackboard[®]. Several of the quiz questions, in addition to questions from the list but not used on the weekly quizzes, are used in the regular lecture/laboratory examinations. Therefore, students realize that it is good to at least review all the potential quiz questions listed for each lecture.

Assignments

A variety of assignments are available in FOR 4033. I typically use only one or two since a number of quizzes, examinations, and laboratory exercises, in addition to the hardwood silviculture project, are used in the course. Prepared assignments include determining stand development trends (using Oliver's [1981] general stand development patterns) and successional changes of 15 tree, shrub, and grass species for an upland site and a bottom-land site after scattering a "magic" bag of seeds. I provided silvical descriptions of the imaginary species that coincide with actual species. Later in the assignment, I invoke a disturbance and students have to determine which species will dominant in a particular stage of stand development and the mechanisms those species used to regenerate after the disturbance.

Another assignment that has gained in importance over the years is the "Diameter-Limit Case Study" used in the Society of American Foresters' code of ethics handbook (SAF, 1996). This assignment requires students to think about their options when presented with a landowner who wants to harvest timber with a maximum profit from the operation with no thought toward future stand management or regeneration. This assignment generates considerable discussion as I also invoke a condition that the forest resource manager, in determining how to proceed, is fresh out of school and has a young family to support. Given the importance of ethics in forest resource management issues, this assignment has proven that students have to be serious in how they approach a problem and resolve it.

Other assignments involve public policy issues related to hardwood management. I present the issue with associated literature and ask specific questions critiquing the validity of the policy and associated literature. For example, a wild turkey recovery plan developed by a state agency placed much of the blame for wild turkey popula-

tion declines on forest management. In reality, much of the decline can be attributed to hunting pressure and conversion of forests to other land uses. Another example involves efforts to save bottomland hardwoods in the Atchafalaya Basin of southern Louisiana. Mandatory easements are being placed on about 300,000 acres. One part of the easement involves no harvesting of particular species of trees below 12-inch stump diameters. Given that much of this forest has been high-graded over the past decades, restrictions such as this may encourage the development of poorly formed trees and less-desirable species. Following the critique questions, I have students develop alternatives to improve the policy while encouraging good hardwood management.

Examinations

I require two examinations during the semester and one final examination. The two examinations during the semester can be composed of two parts—a comprehensive and “closed-book” part during a designated examination period and a take-home part. The “closed-book” part of the examination includes material covered up to the time of the exam. I use a variety of examination techniques, including multiple-choice, short answer, true and false (with students having to correct false questions by changing nouns—changing verbs is not allowed), and filling in diagrams such as Hodges (1997) species-site relationships figures. I have found that students respond best to a variety of question formats. The take-home part of the examination, which I do not always use, involves developing stand prescriptions for specific conditions (usually several observed in laboratory) and contrasting landowner objectives. I encourage creative, but well justified, thinking. In some instances, I have required students, as part of the take-home examination, to critique a scientific article specific to hardwood research. In addition to general questions related to the results of the research, I ask students to critique the results and how they may be applied to specific hardwood management scenarios. I also ask students to dissect the introduction section of the article. I have found this question to be particularly important as a way for students to develop a logical flow in their own writing exercises. Finally, I ask specific questions related to the research hypothesis(es) and methods to reinforce in students the importance of research and following the scientific method. Needless-to-say, it is important to select good research articles.

The final examination is open-book, open-notes, open to any information students can carry into the classroom. Students are also required to bring a ruler. I usually have a two-question final examination. The first question is always the same (and the students know it is coming even early in the semester). Given the information provided throughout the semester, the first question requires students to develop an inventory sheet for conducting a hardwood tree inventory. Most pine inventory sheets simply require designation by d.b.h. and number of merchantable logs using a dot-tally format. Hardwood inventory, using the tree class system, requires considerably more detail. This question requires students to integrate much of the course information into one useful page. The second question involves developing silvicultural prescriptions for a stand observed during the semester. Emphasis is placed throughout the semester on students taking “mental photographs” of stands visited. Therefore, any stand visited in laboratory can be included on the final examination. I provide two or three management objectives that have to be met by these prescriptions.

Hardwood Silviculture Project

The hardwood silviculture project involves the development of a hardwood silviculture plan for a non-industrial private forest landowner with students assigned to consulting teams. The objectives of this project include the following: (1) for students to gain experience in the development of plans for landowners; (2) for students to gain experience in interacting with a real non-industrial private forest landowner, including asking proper questions and displaying professionalism in the presence of a potential client; and (3) to integrate the concepts and materials presented in the course in the development of a viable set of silviculture alternatives for managing selected stands to meet the landowner’s objective(s). This project is conducted in a competitive format—i.e., the landowner will pick the winning team at the end of the semester and a “prize” (usually a meal at a restaurant of the students’ choice) will be awarded.

I initiate this project early in the semester by having the designated “consulting teams” develop a real, bona fide business card. Later in the semester, after students have received a number of hardwood lectures and management tools, I have the landowner attend lecture and give the teams the opportunity to meet the landowner and ask him or her specific questions. I have found that it is best to have the teams meet the landowner separately as some teams do not want the other teams to know what they are thinking or planning. Prior to this meeting, the class will have visited the designated stands (usually two or three stands located near each other) to have a better idea of what the landowner possesses regarding his or her hardwood resources. Ideally, I would like for the teams to inventory each stand, but I have found this to be a logistical problem given the amount of time needed in laboratory for other endeavors. To date, I have been able to find landowners with some knowledge of forest management, even having an inventory of the stands in question and willing to provide this inventory to the class.

The last laboratory period is scheduled for the consulting teams to present their results to the landowner. While the presentation format is open to any tools available to the students, I do require as a minimum a PowerPoint® presentation. Students are also required to present copies of their plan to the landowner and me. Grading the project is based on the initial meeting, the business card, the plan cover letter, presentation of the plan to the landowner, general information within the plan (e.g., soils, topography, etc.), prescriptions, justification of prescriptions, conclusions, appendices, and student self evaluations. Student self-evaluations are particularly important as a tool to determine the role each individual played in the conduct of the project. Overall, I have been pleased with the results of this project but have considerable room for improvement. Specific improvements include better evaluation tools to distinguish active participants from those who do little work and better communication with the teams.

Quality-of-Expression Policy

All assignments, the hardwood silviculture project, quizzes, and the take-home portion of examinations are subject to a quality-of-expression policy. Simply stated, students are held responsible for using the English language with a proficiency that can be reasonably expected of a senior in college. Accordingly, I usually deduct one point for every grammar or organization/appearance error and three points for each spelling error in each assignment, the hardwood silviculture project, and the take-home portion of examinations. I grammar-grade the first assignment but do not deduct the points from the actual grade. This shows the students the effect of their grammar on their grade and how I use the quality-of-expression policy in grading. In general, grammar does improve during the semester, especially for those students who continue to have problems misspelling words.

BLACKBOARD®

Overview

Blackboard® 5, a technology instruction tool, is a Web-based teaching platform that allows an instructor to organize and deliver course materials in more effective manner and for easy access by students. Advantages of using Web-based instructional tools such as Blackboard® include

Improved organization. Using Web-based instruction tools forces instructors to be better organized in their course preparation and presentation. Depending on the material presented on the Web, instructors must organize materials to specific folders (or directories) and be more prompt in grading materials. Lecture presentations, especially when using PowerPoint®, become similar to “presenting papers at professional meetings” except you are conducting the presentation in a classroom environment and interacting with students. Simply put, instructors put their course out for the world to see when using Web-based instructional tools.

Presenting more information to students in a timely manner. An instructor can incorporate text, pictures, and graphs into single slides without having to switch from podium to chalkboard to overhead projector to slide projector without getting lost. Since lectures tend to move more rapidly with this technology, the instructor can present more material within a given lecture period, but caution is warranted to not go too fast.

Greater teaching effectiveness. Greater teaching effectiveness results from the combination of being more organized and presenting more information for students to synthesize that allows for a greater teaching experience. Specific points in lecture, including take-home messages, can be highlighted and more thoroughly explained.

Greater communication. Greater communication is accomplished by providing information to students on the Web prior to lecture. Students are better prepared for lecture, including more discussion of issues related to the lecture during the lecture period. Also, student questions and other communications can be incorporated into discussion groups through the Web environment, allowing for more learning opportunities outside of the traditional classroom. Course administrative items, such as last-minute changes in laboratory schedules, can be quickly communicated to students through these Web-based instructional tools. Finally, team project information, such as the hardwood silviculture project described above, can be communicated to specific teams without communicating to the whole class.

Students can obtain real-time grades. Most, if not all, Web-based instructional tools have the capability to post grades and calculate real-time percentages so students know at all times where they stand in the course.

Evaluate student learning through tracking usage. Most, if not all, Web-based instructional tools allow the instructor access to when students have been online in the course. Several programs even let the instructor know which specific files the students have been using by tracking the number of hits students make to specific files. While this form of evaluation should not be used as the primary way to evaluate student learning, it does give the instructor some indication of which students are working with the materials and which students are not. Students not taking advantage of this opportunity can then be approached, in a one-on-one setting, and asked why they are not using the materials. Such an approach usually results in greater usage by these students (usually these students are unaware that their usage could be tracked by the instructor).

Continuing education and distance-learning opportunities. Web-based technology in instruction can be used for distance learning, especially if the needed files are loaded onto the Web instructional program. These activities are becoming increasingly important as universities expand their teaching mission to remote locations within the state, region, country, and world.

Disadvantages of using Web-based instructional tools include

Computer savvy. Web-based instructional tools require that the users, i.e., the instructor and the students, become computer savvy. Today, most, if not all, college students are computer savvy. Most, but not all, instructors are computer savvy. Therefore, as an instructor, you must become familiar with the terms and operations of Web-based programs.

Patience with the learning curve. Use of Web-based instructional tools requires—in fact, demands—the instructor be patient while learning the nuances of new computer programs. As with any computer program, there is a somewhat steep learning curve with Web-based instructional tools, but once you get use to using such a program it will become second nature. I have also found that it is helpful to read the instruction manual.

Time commitment. Without question, the greatest disadvantage (or requirement) for using Web-based instructional tools is making the time commitment needed to develop or transform courses. Most of this time commitment is spent learning the program and developing the PowerPoint® lecture presentations. This time commitment can also be viewed as an opportunity to update notes with new information, experiences, ideas, literature, etc.

Student attendance. A common problem discussed with colleagues concerning providing information to students through Web-based instructional programs, such as lecture notes, is that students will not attend class. I have found this not to be the case in my hardwood course for reasons stated below, but attendance in lower-level courses, such as freshman and sophomore courses, can be an issue.

Blackboard® was first introduced to the entire LSU campus in the Fall 2000 semester and was first used in FOR 4033 in the Spring 2001 semester. To date, Blackboard® has allowed me to present more information regarding the ecology, silviculture, and management of hardwood to students in a more effective format. While I do not use Blackboard® to the fullest extent possible, and I still have a ways to go on the Blackboard® learning curve, I will present how I utilize this program in FOR 4033.

After students log into the course through Blackboard®, they have of choice of Content Area to choose from. I generally keep all my course materials in the Course Documents section even though general course items, such as the syllabus, may be more appropriate for the Course Information section. I primarily use the Course Documents section so students do not have to search for specific files through different content areas.

Course Materials Available to Students

In the Course Documents area, I maintain ten folders. These folder are (in order of appearance in the Course Documents area) as follows: (1) general course information, (2) lecture notes, (3) lecture presentations, (4) over-heads, (5) required readings, (6) additional information readings, (7) potential quiz questions, (8) assignments, (9) laboratory notes, and (10) examinations. All files within each folder are printed in a pdf format so students can access the files with Adobe Acrobat®.

The general course information folder contains items related to the conduct of FOR 4033. Files include the course syllabus, a memorandum on how to join the Southern Hardwood Forestry Group, Joyce Kilmer's poem entitled "Trees," etc. File sizes are typically small.

The lecture notes folder contains the lecture notes and supporting information for each lecture. A given lecture notes file contains the objectives for that lecture, the required reading citations, sources of additional information reading citations, an educational quote, course outline, and the detailed lecture notes. The detailed lecture notes also contain the specific locations of PowerPoint® slides so students can cross-reference the notes with the PowerPoint® presentation used in lectures. I end each lecture file with a conclusion relating the importance of the lecture to hardwood management. File sizes range from 50-120 kilobytes.

The lecture presentations folder contains the PowerPoint® lectures. Each lecture has its own PowerPoint® file. It is these files that I use to conduct lecture. Since the course is field oriented, I use a considerable number of photographs in the PowerPoint® presentations. I am in the process of having all my hardwood slides scanned. These slides are scanned using the tiff format and placed in permanent storage. From here, I touch up pictures as needed and save in a jpeg format so that each picture is about 500 kilobytes in size. Given the number of pictures and graphs used in lectures, PowerPoint® file sizes range from four megabytes to as large as 37 megabytes. Current problems associated with the larger files are noted below. Each slide can be cross-referenced with the lecture notes.

The overheads folder contains graphs used in lecture that I deem important. Therefore, students can print these specific overheads and include them in their notes. Since overhead files contain only one overhead per file, file sizes are small.

The required readings and sources of additional information folders contain the various readings as listed in the lecture notes. I usually scanned these files but use Web sites (especially for larger publications) whenever possible. Of all the things I do in this course, scanning readings, especially the additional information readings, takes the lowest priority. File sizes range from 5-120 megabytes.

The remaining folders—potential quiz questions, assignments, laboratory notes, and examinations—contain small files. The potential quiz questions files are specific to each lecture, with one file per lecture. The assignment files contain the various assignments as previously described. The laboratory notes files contain information specific to the conduct of each laboratory whether it be an exercise with an associated assignment or a field tour. The examinations file contains the files of examinations given in previous years. File sizes range up to 30 kilobytes.

COURSE CONDUCT ISSUES

The Spring 2001 semester was the first time I used Blackboard[®] (or any other Web-based instructional tool) in FOR 4033. Since I also taught FOR 4033 in the Spring 2000 semester, I can make several comments between students with access to Blackboard[®] and those without access.

Student Participation

Student participation using Blackboard[®] improved compared with the previous year. Students were better prepared for discussion in lecture because most had reviewed the lecture notes and read most of the required readings. Lectures were conducted at a more rapid pace, giving more time for discussing specific hardwood issues related to lectures.

Attendance

A common problem discussed with colleagues concerning providing lecture notes to students prior to class is class attendance. While a mandatory attendance policy does not exist in FOR 4033, I found students regularly attended class. This was due primarily to the optional nature of the course. Students enroll in FOR 4033 because they have an interest in hardwood silviculture and management. Furthermore, they realize that a broader management background that includes both pines and hardwoods will make them more competitive for various employment opportunities. Also, since students are either seniors or graduate students, their higher maturity level results in greater responsibility to attend class.

Time Commitment

Implementing FOR 4033 onto Blackboard[®] and developing PowerPoint[®] lecture files is, in many ways, like developing a new course. Considerable time is needed to update lectures, scan pictures, graphs, and readings, and develop the PowerPoint[®] presentations. In general, it took me about two or three days to re-tool a lecture for presentation on Blackboard[®] without including the additional information readings. This time also included updating lecture notes with new information and ideas.

Use of Blackboard®

Beginning in the Fall 2001 semester (Spring 2002 semester for FOR 4033), the LSU Computer Services department took over the administration of Blackboard®. Prior to this time, the LSU College of Agriculture had implemented Blackboard®. The primary difference in administration of Blackboard® is memory allocation. Previously, there was no file size or total memory allocation limitation to individual courses. Currently, an 80-megabyte limitation is put on each course taught at LSU with an individual file size limitation of 12 megabytes. These limitations significantly affect FOR 4033 as I have to limit the number of lectures uploaded to the mainframe to about four at any given time. Before I can add a new lecture with associated files I have to remove a lecture. Furthermore, I cannot upload either required readings or sources of additional information readings. Instead, I keep two copies of required readings available in the Student Reading Room located within the Renewable Natural Resources Building.

Another problem encountered using Blackboard® was student printing of the larger files. Because of the large size of some of the files, especially the reading files, students had difficulty accessing these files when using older (and slower) computers. Printing has been improved within the past year in the school with the purchase of newer and faster computers. Problems still exist with home access and printing due to slow telephone lines.

Future Course Improvements

One idea that I have contemplated for the past year is to take a one-week field trip to hardwood forest cover types considerably north and northeast of Louisiana. This trip would be conducted during spring break so as to not interfere with students' course schedules. Specifically, I would like to take students on a transect from the Allegheny Mountains in northern Pennsylvania down through the Appalachian Mountains in northern Georgia. Students would observe the ecology, silviculture, and management of a variety of hardwood forest cover types, ranging from the black cherry (*Prunus serotina* Ehrh.)-sugar maple (*Acer saccharum* Marsh.) stands in Pennsylvania, the red river and black river bottoms of the Atlantic Coastal Plain, through the yellow-poplar (*Liriodendron tulipifera* L.) and other cove hardwood types of southern Appalachia. Students would also be exposed to the many issues that confront the management of these hardwood forest cover types including various social needs and constraints. The primary goal for conducting this trip would be to expose students to other hardwood cover types in different parts of the country. The format for this trip would closely follow the Regional Forest Studies course administered by Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick, Canada (for more details, see Web site: <<http://www.unb.ca/standint/asdm/regioncourse.html>>).

CONCLUSIONS

Teaching a hardwood silviculture and management course is necessary given the increased interest in hardwoods. A variety of teaching techniques are utilized in this course including weekly student lecture participation, weekly reading quizzes, hands-on laboratory experiences, and development of a silviculture plan with a non-industrial private forest landowner. Utilization of a broad array of teaching techniques is necessary to maintain student involvement and interest throughout the semester.

In terms of teaching effectiveness, Web-based instructional tools, such as Blackboard®, represent one of the biggest breakthroughs for instructors since chalk and chalkboards. Today's students are very computer savvy and any use of Web-based instructional tools is, to a degree, simply keeping up with the contemporary world and keeping pace with a very computer literate society. Use of these tools also represents great opportunities to enhance the learning environment. Instructors can present more information in a timely manner and students, at least in my experience, have been receptive to this format and are benefited by it. Finally, Web-based instructional tools should be used wisely. Developing or re-tooling courses for the Web requires considerable time. Also, it is easy to get carried away and try to do too much.

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