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Proceeding of the Fourth Biennial Conference on University Education in Natural Resources



Natural Resources and Environmental Issues

Volume IX

2002

**Proceedings of the
Fourth Biennial Conference on
University Education in Natural Resources**

**March 14-17, 2002
North Carolina State University
Raleigh, North Carolina**

Gary B. Blank, compiler

**Sponsors: U.S.D.A. Cooperative State Research, Education, and Extension Service
North Carolina State University College of Natural Resources
North Carolina State University Department of Forestry
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TABLE OF CONTENTS

Author Index	xi
Introduction <i>Gary B. Blank</i>	1
 Friday, March 15, 2002	
FACILITATED DISCUSSIONS	
Student Perceptions of a High-Quality Undergraduate Experience: Implications for Teaching and Learning in Natural Resources <i>Terry L. Sharik, J. Douglas Wellman, Sarah Banks, Erick T. Byrd, David Cardenas, and Tricia M. Day</i>	2
Leading Study-Abroad Programs: Some Examples from Nicaragua and Panama <i>A. L. Hammett and B. R. Murphy</i>	4
The International Experience: Natural Resource Education Overseas <i>Erin O. Sills</i>	5
Making the Transition from Passive to Active Experiential Learning <i>Aaron N. Moen</i>	6
 PAPER PRESENTATIONS: "COMMUNITY AND NATURAL RESOURCES"	
Recapturing the Wonder in Natural Resources: Perspectives from a Community of Lifelong Learners <i>Geoffrey Habron, Rebecca Bernard, Christina Carra, Leroy Harvey, Shawn Mullaly, Carole Robinson, and Michael Rodriguez</i>	7
The Role of Civic Responsibility in Learning and Thinking about Natural Resources <i>Dorothy H. Anderson</i>	7
Teaching Restoration Ecology as if the Community Mattered <i>Anton G. Endress</i>	8

PAPER PRESENTATIONS: "RHETORIC AND WRITING"

- Professional Writing for a Natural Resource Policy Course
Jeff Edgens and Tom Greider 9
- Rhetoric Associates in Natural Resources: Influences on Undergraduate Education at Utah State University. Part I: Fundamentals of the Program and Influences on Mentors
Terry Sharik, Mark Brunson, Claudia Anderson, Summer Kartchner, Bowdie Pollock, and Joyce Kinkead 9
- Rhetoric Associates in Natural Resources: Influences on Undergraduate Education at Utah State University. Part II: Influences on Student Recipients and Faculty
Terry Sharik, Mark Brunson, Claudia Anderson, Summer Kartchner, Bowdie Pollock, and Joyce Kinkead 10

PAPER PRESENTATIONS: "GEOGRAPHICAL INFORMATION SYSTEMS"

- Using Geographic Information Systems as a Common Ground for Dialogue about Watershed Stewardship
Brian D. Lee and Lysle S. Sherwin 10
- Using GIS as a Watershed Management Education Tool
T. M. Williams, W. R. English, Donald J. Lipscomb, and Christopher S. Nickel 11
- Mapping Forest Communities Using GPS and GIS
Bob Ford 11

WORKSHOPS

- Encouraging Critical Thinking about Advocacy
Jim Berkson, Brian Murphy, and Tammy Newcomb 11
- Teaching and Learning in Context in Natural Resources Science and Management
Virginia S. Lee, Alan Letarte, and Sarah Banks 12
- Fostering Creativity in the Environmental Classroom: Seeking Creative Solutions through Active Participation
Carole F. Robinson and Peter J. Kakela 12

PAPER PRESENTATIONS: "SPATIAL TECHNOLOGIES"

An Electronic Performance Support System (EPSS) for Natural Resource Planning: Making the Limits of Acceptable Change (LAC) System Interactive
Michael A. Tarrant and Liyan Song 16

A Cooperative Approach in GPS Training
Peter E. Linehan, Mike Sherwood, Craig Houghton, and Elizabeth Brantley 16

PAPER PRESENTATIONS: "TEACHING TECHNIQUES"

Finding Balance in the Educational System: A Problem-Based Learning Experience
Neville D. Peasley 17

Teaching Forest Measurements Online: An Overview of the Initial Experience at the University of Arkansas-Monticello
Paul F. Doruska 19

Distance Education in Fire Ecology
Mark Reed 24

Internet-Based Forestry Extension: Using It in the Classroom
Jonathan High and Michael Jacobson 24

PAPER PRESENTATIONS: "EXPERIENTIAL LEARNING"

Experiential Learning at California Polytechnic State University's Swanton Pacific Ranch
Samantha J. Gill 25

Undergraduate Student Internships in Natural Resources at Virginia 4-H Educational Centers
Jeff Kirwan, Barry Fox, and Barry Garst 26

Infusing Experiential Learning into a Wildlife Curriculum: Two Models for One Course
Kelly F. Millenbah and Joshua J. Millspaugh 30

The Keystone Project: Training Watershed Professionals through Experiential Learning
L. S. Sherwin and C. A. Cole 30

SATURDAY, March 16, 2002**FACILITATED DISCUSSIONS**

- Recapturing the Wonder in Natural Resources: Perspectives
from a Community of Lifelong Learners
*Geoffrey Habron, Rebecca Bernard, Christina Carra, Leroy Harvey,
Shawn Mullaly, Carole Robinson, and Michael Rodriguez* **31**
- Curricular Threads: Integrated Themes from Introductory to Capstone Courses
T. J. Newcomb, B. R. Murphy, and J. M. Berkson **31**
- Sustainable Forest Management Graduate Education
James C. Finley, Michael P. Washburn, and Laurie Schoonhoven **36**

PAPER PRESENTATIONS: "FORESTRY EDUCATION ONLINE"

- Introduction to the Sustainable Forestry Virtual Tour
David Zahler and Rick Fletcher **37**
- Comparing the Effectiveness of Virtual and Traditional Forestry Field Tours
Elissa C. Easley, Richard A. Fletcher, Edward C. Jensen, and Mark Rickenbach **37**
- Teaching Forest Economics as a Distance Learning Course
Sun Joseph Chang **41**
- Teaching a Hardwood Silviculture and Management Course: Experience
and Ideas Including Using Blackboard® Web-Based Courseware
Brian Roy Lockhart **41**

PAPER PRESENTATIONS: "CAPSTONE COURSES"

- Developing a Field Experience for Natural Resource Majors
F. A. Baker and J. Shaw **54**
- Ecosystem Prescription Preparation: A Rocky Mountain High!
Steven A. Knowe and Ron Hay **55**
- Integrated Resource Management Courses: Lessons
Learned after Six Years
Hugh O. Canham **55**

PAPER PRESENTATIONS: "ADULT AND GRADUATE EDUCATION"

An Online Forest Biology and Tree Identification Graduate Class for Public School Educators <i>John R. Seiler and W. Mike Aust</i>	62
Adult Learners' Perception of Outreach Programs Delivered by Video Conferencing <i>Robert E. Bardon and W. Scott Payne</i>	63
Learning and Living: Connecting Graduate Education in Natural Resources with the Scholarship of Engaged Learning Institutions and the Outreach Mission of Land-Grant Universities <i>Shari L. Dann and Jack M. Payne</i>	63
Achieving Sustainable Forest Management and Certification in the Southeast: Development of a Distance Learning Course <i>Susan Moore and Fred Cabbage</i>	71

PAPER PRESENTATIONS: "ASSESSMENT"

Examining Relationships between Forestry Learning and Student Background <i>James J. Zaczek and Jean C. Mangun</i>	71
Teaching Silvics: Student Performance and Evaluations in Web-Based and Traditional Classroom Courses <i>John Duff Bailey and Thomas E. Kolb</i>	72
Development of a Program Assessment System at the SUNY-ESF Ranger School: The Process, Early Results, and Anticipated Benefits <i>James M. Savage</i>	72
Comparison of Academic Statistics of Two-Year College Transfer and Native Fisheries and Wildlife Students at the University of Missouri <i>Janice E. Faaborg, Joshua J. Millspaugh, and Mark R. Ryan</i>	79

WORKSHOPS

Using the Forest Vegetation Simulator as a Teaching Tool <i>John D. Shaw</i>	84
---	-----------

Structured Educational Design Workshop
Pierre Zundel and Ted Needham **84**

Integrating Spatial Information Technologies into Natural
 Resources Curricula
Heather Cheshire and George Hess **85**

PAPER PRESENTATIONS: "REFORMING PROGRAMS"

Introducing Problem-Based Learning Techniques into the Natural
 Resource Management Curriculum at the University of Delaware
*Steven E. Hastings, Dewey M. Caron, Thomas W. Ilvento,
 and Joshua M. Duke* **85**

Two Birds, One Stone: Can a Natural Resources "Core" Class
 Serve the Entire University?
Mark W. Brunson and Claudia L. Anderson **91**

Teaching to Learn and Learning to Teach: A Case Study of
 Multilevel, Interdisciplinary Education in Natural Resources
*Catherine Borer, Peter Newman, Clare Ginger,
 John Shane, Mary Watzin* **93**

The I's and E's of Natural Resources Education,
 or, Moving from Learner To Teacher
Gary J. San Julian **94**

FACILITATED DISCUSSIONS

Undergraduate Enrollment in Natural Resource Programs:
 Demand and Reality
Lisa Schabenberger **96**

What to Teach in Forest Management and How to Teach It
Marc E. McDill **97**

From "Natural Resources" to "Environment":
 Broadening Our Mission and Message
Robert Manning and Donald DeHayes **97**

POSTERS

Looking Before We Leap: A Three-Part Study to Prepare for College Reorganization <i>Claudia L. Anderson and Mark W. Brunson</i>	98
Web-Based Technology in Undergraduate Instruction: A Primer for Moving Beyond Accessibility to Measures of Efficiency <i>Nick J. Balster and Phillip Barak</i>	104
Characterizing Undergraduate Forestry Majors at Southern Illinois University <i>David D. Close and Jean C. Mangun</i>	106
Distance Education Courses in Natural Resources through the Department of Fisheries and Wildlife at Oregon State University <i>Paula J. Minear and W. Daniel Edge</i>	106
The Influence of Student Characteristics in Their Evaluation of a Park-Planning Course Web Site <i>Yu-Fai Leung and Mark I. Ivy</i>	107
Recreation GPS as a Low-Cost Alternative for Introductory Courses in Natural Resources <i>Jason Payne, Glenn P. Catts, Richard A. Lancia, and Brent Lineberger</i>	107
Development of a Graduate Specialization in Protected Areas Management <i>Dennis B. Propst and Maureen H. McDonough</i>	108
Establishing a Learning Community in an Undergraduate Natural Resource-Based Recreation Program <i>Dennis B. Propst</i>	108
A New Professional Development Course for Doctoral Students <i>J. Douglas Wellman</i>	109

AUTHOR INDEX

if first author, page number in bold, e.g., **6**

if other author, page number in italic, e.g., *6*

if abstract only, page number will have an asterisk appended, e.g., **6*** or *6**

A

Anderson, Claudia L.: *9**, *10**, *91*, **98**

Anderson, Dorothy H.: **7***

Aust, W. Mike: *62**

B

Bailey, John Duff: **72***

Baker, F. A.: **54***

Balster, Nick J.: **104**

Banks, Sarah: *2*, *12**

Barak, Phillip: *104*

Bardon, Robert E.: **63***

Berkson, J. M.: **11***, *31*

Bernard, Rebecca: *7**, *31**

Blank, Gary B.: **1**

Borer, Catherine: **93***

Brantley, Elizabeth: *16**

Brunson, Mark W.: *9**, *10**, **91**, **98**

Byrd, Erick T.: *2*

C

Canham, Hugh O.: **55**

Cardenas, David: *2*

Caron, Dewey M.: *85*

Carra, Christina: *7**, *31**

Catts, Glenn P.: *107**

Chang, Sun Joseph: **41***

Cheshire, Heather: **85***

Close, David D.: **106***

Cole, C. A.: *30**

Cubbage, Fred: *71**

D

Dann, Shari L.: **63**

Day, Tricia M.: *2*

DeHayes, Donald: *97**

Doruska, Paul F.: **19**

Duke, Joshua M.: *85*

E

Easley, Elissa C.: **37**

Edge, W. Daniel: *106**

Edgens, Jeff: **9***

Endress, Anton G.: **8***

English, W. R.: *11**

F

Faaborg, Janice E.: **79**

Finley, James C.: **36***

Fletcher, Richard A.: *37**, *37*

Ford, Bob: **11***

Fox, Barry: *26*

G

Garst, Barry: *26*

Gill, Samantha J.: **25**

Ginger, Clare: *93**

Greider, Tom: *9**

H

Habron, Geoffrey: **7***, **31***

Hammett, A. L.: **4***

Harvey, Leroy: *7**, *31**

Hastings, Steven E.: **85**

Hay, Ron: *55**

Hess, George: *85**

High, Jonathan: **24***

Houghton, Craig: *16**

I

Ilvento, Thomas W.: *85*

Ivy, Mark I.: *107**

J

Jacobson, Michael: *24**

Jensen, Edward C.: *37*

xii

K

Kakela, Peter J.: *12*
 Kartchner, Summer: *9**, *10**
 Kinkead, Joyce: *9**, *10**
 Kirwan, Jeff: **26**
 Kolb, Thomas E.: *72**
 Knowe, Steven A.: **55***

L

Lancia, Richard A.: *107**
 Lee, Brian D.: **10***
 Lee, Virginia S.: **12***
 Letarte, Alan: *12**
 Leung, Yu-Fai: **107***
 Lineberger, Brent: *107**
 Linehan, Peter E.: **16***
 Lipscomb, Donald J.: *11**
 Lockhart, Brian Roy: **41**

M

Mangun, Jean C.: *71**, *106**
 Manning, Robert: **97***
 McDill, Marc E.: **97***
 McDonough, Maureen H.: *108**
 Millenbah, Kelly F.: **30***
 Millspaugh, Joshua J.: *30**, *79*
 Minear, Paula J.: **106***
 Moen, Aaron N.: **6***
 Moore, Susan: **71***
 Mullaly, Shawn: *7**, *31**
 Murphy, Brian R.: *4**, *11**, *31*

N

Needham, Ted: *84**
 Newcomb, Tammy J.: *11**, **31**
 Newman, Peter: *93**
 Nickel, Christopher S.: *11**

P

Payne, Jack M.: *63*
 Payne, Jason: **107***
 Payne, W. Scott: *63**
 Peasley, Neville D.: **17**
 Pollock, Bowdie: *9**, *10**
 Propst, Dennis B.: **108***, **108***

R

Robinson, Carole F.: *7**, **12**, *31**
 Rodriguez, Michael: *7**, *31**
 Reed, Mark: **24***
 Rickenbach, Mark: *37*
 Ryan, Mark R.: *79*

S

San Julian, Gary J.: **94**
 Savage, James M.: **72**
 Schabenberger, Lisa: **96***
 Schoonhoven, Laurie: *36**
 Seiler, John R.: **62***
 Shane, John: *93**
 Sharik, Terry L.: **2**, **9***, **10***
 Shaw, John D.: *54**, **84***
 Sherwin, Lysle S.: *10**, **30***
 Sherwood, Mike: *16**
 Sills, Erin O.: **5**
 Song, Liyan: *16**

T

Tarrant, Michael A.: **16***

W

Washburn, Michael P.: *36**
 Watzin, Mary: *93**
 Wellman, J. Douglas: **2**, **109***
 Williams, T. M.: **11***

Z

Zaczek, James J.: **71***
 Zahler, David: **37***
 Zundel, Pierre: **84***

INTRODUCTION TO THE PROCEEDINGS OF THE FOURTH BIENNIAL CONFERENCE ON UNIVERSITY EDUCATION IN NATURAL RESOURCES

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The papers and abstracts that follow constitute the proceedings of the Fourth Biennial Conference on University Education in Natural Resources, held March 14-17, 2002, in Raleigh, North Carolina. The conference, hosted this year by the College of Natural Resources at North Carolina State University, addressed teaching practice, educational issues, and the scholarship of teaching in natural resources sciences and management. Participants numbered 124.

Six workshops, thirty-nine session papers, and nine facilitated discussions filled two full days of energetic exchange. Nine posters presented varied teaching and educational research projects. Faculty and administrators, joined by graduate and undergraduate students, shared ideas and discussed issues arising from teaching and learning in the variety of natural resources programs that exist across North America. The camaraderie and genuine love for what we do remained apparent throughout the sessions and social interactions.

The program demonstrated an increasing emphasis on teaching with technology and teaching students how to use evolving technologies for environmental decision making. Yet, the program also focused much attention on social and interpersonal relationships at the core of good teaching and good environmental decision making. Issues such as enrollment projections and topics such as the international experience of leading study tours overseas provided lively exchanges of perspectives and ideas for collaboration in the future. Workshops covered topics such as course design based on assessment and building learning communities.

In our final session, on Sunday morning, assembled participants decided that the Quinney Library at Utah State University will be the permanent repository for proceedings of this and all conferences in the series. We also decided that the fifth conference in the series will convene in two years in Flagstaff, Arizona, where Northern Arizona State University will be host. In 2006, Michigan State University will host the conference in East Lansing.

I want to extend sincere gratitude to all those who helped me host the conference and all those who participated. They made this a successful meeting and made all the planning effort worthwhile.

STUDENT PERCEPTIONS OF A HIGH-QUALITY UNDERGRADUATE EXPERIENCE: IMPLICATIONS FOR TEACHING AND LEARNING IN NATURAL RESOURCES

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ABSTRACT: Richard Light (2001) recently published what many consider to be one of the most insightful treatments of what *students* think constitutes a high-quality undergraduate experience and what can be done by the academy to create an environment that fosters this experience. It is based on a decade of research involving interviews with more than 1,600 undergraduates (mostly seniors), with questions designed by more than 60 faculty members from more than 20 colleges and universities, and results shared more widely with more than 90 colleges and universities (suggesting broad applicability). We highlighted Light's ten major findings for the participants (largely faculty) in our facilitated discussion session. Then, using breakout groups, we asked them to reflect on their own experiences relative to these major findings and indicate positive and/or negative aspects of each for undergraduate education in natural resources. Below we state each finding and summarize participant responses.

Finding 1: A large majority of students say they learn significantly more in courses that are highly structured with many quizzes and short assignments.

Response: The majority of the participants agreed with this finding. They believed this was especially true in natural resources courses and in introductory courses. A few of the panelists expressed concern that highly structured courses may involve memorizing facts and figures and not prepare students to think critically, which in turn would not prepare the student for the senior class or his or her first job.

Finding 2: Working together on homework assignments increases both learning and engagement in classes.

Response: Overall, it was concluded that working together on assignments can be a positive experience for students. It allows them to experience part of a real-world environment where they are forced to work with others, often with different backgrounds and ideas than themselves. Moreover, it is a more active form of learning and thus engages students more than working alone. It was noted that there are many different approaches and philosophies to implementing group assignments in a class setting. Participants felt that the only major drawback to group assignments is that they can make it difficult to evaluate individual performance and understanding of the topic.

Finding 3: Students who get the most out of college, who grow most academically, and who are happiest organize their time to include activities with faculty members, or with several students, focused on accomplishing substantive academic work.

Response: Most participants agreed with this statement. It was felt that an important contribution of faculty advisers is to get students involved with something that is meaningful to them, which can be a real challenge where academically challenged or unmotivated students are involved, or advising loads are heavy. There was some

feeling that such contributions by faculty may not be rewarded by the institution, and thus faculty may have to be content with the self-satisfaction that comes from doing the right thing.

Finding 4: Small-group tutorials, small seminars, and one-on-one supervision are, for many students, their capstone experience.

Response: There was general agreement with this finding, especially early on at the freshman or sophomore level, as it helps students to learn proper study habits and to access information. It may also help with student retention at the university level. Drawbacks to these approaches included the large amount of time investment on the part of faculty and overdependence by students on others.

Finding 5: Many students identified a mentored internship, where students create their own project and implement it under the supervision of a faculty member, not done for academic credit, as a particularly critical or profound experience at college.

Response: The participants agreed that mentored internships could be beneficial for both students and faculty, although as a group they had little experience with this form of teaching and learning. The key to success is to focus on the process, not the product. The fact that such experiences are not for credit or pay was considered very important.

Finding 6: Learning outside classes, especially in residential settings and extracurricular activities (such as the arts), is vital.

Response: There was general agreement with this finding. Outside activities seem to offer a break from the focus in the classroom and allow for creativity and self-expression upon returning to the classroom. Moreover, such activities tend to enhance skills for success in the workplace.

Finding 7: A large majority of students describe particular activities outside the classroom as profoundly affecting their academic performance.

Response: The group agreed that activities outside the classroom had an effect on a student's academic performance, and that this effect could be positive or negative depending on what the activity is, how much time the student devotes to this activity, and the basic nature of the student. If an activity is a distraction from class, where a student is able to relax and get refreshed, then it is likely to be positive. If, on the other hand, the activity is considered to be in competition with class, then there are likely to be negative effects. The participants also felt that any activity or group of activities that took up more than 20 hours a week outside of class are likely to have negative effects.

Finding 8: For most students, the impact of racial and ethnic diversity on their college learning experience is strong, and a purposeful campus atmosphere and living arrangements are crucial to success.

Response: Most participants agreed that integration of various races and ethnic groups must be engineered, preferably starting in the freshman year. However, they noted that in order to do so, there had to be such diversity to begin with, which is a problem for most natural resource programs. Most diversity in such programs is associated with area of study (major), geographic origin, and social-economic background of students. Homogeneity among faculty can also hinder diversity in the student body. Prestigious colleges and universities with large endowments are much more likely to have this diversity. The recent increase in gender diversity in natural resource programs was thought to promote a shift in perspectives, e.g., an increased emphasis by females on interrelationships.

Finding 9: *Students care deeply about writing and hunger for specific suggestions about how to improve it.*

Response: This assertion did not match with the experience of natural resource faculty. One key to addressing the challenge is to consider two major goals for writing, i.e., sharing information and providing a way of learning. With respect to the latter, it seems useful to think in terms of writing that synthesizes and writing for deeper learning.

Finding 10: *Students talk about foreign languages and literature with special enthusiasm.*

Response: In general, this assertion is not supported by the experiences of natural resource faculty. Foreign languages and literature are not key components in natural resource curricula, and it would be difficult to make them so. Most of our students don't see the value in spending their time and energy with these topics.

LITERATURE CITED

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LEADING STUDY-ABROAD PROGRAMS: SOME EXAMPLES FROM NICARAGUA AND PANAMA

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ABSTRACT: During the past five years, Virginia Tech's College of Natural Resources has conducted three study-abroad courses in Central America. The classes in Nicaragua and Panama have focused on key factors affecting management of natural resources—forestry, watershed management, fisheries, wildlife, and forest products. The format includes field exercises; visits to natural resources projects and agencies; team, classroom, and lab sessions; and self-directed study. Each course is designed to maximize contacts with natural resources management practitioners. Many students return for further study or to work in areas that we visit. The courses are team-taught to involve faculty new to international teaching. Several local students are involved, maximizing cross-fertilization of ideas. The course has led to increased international involvement of faculty, and new research and outreach projects. The presentation will stress lessons learned and how they have influenced the college's international program.

THE INTERNATIONAL EXPERIENCE: NATURAL RESOURCE EDUCATION OVERSEAS

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ABSTRACT: What are the unique challenges and benefits of natural resource education overseas? This session addressed these questions in the context of short-term study programs in forestry and other natural resource fields. The panel included Tom Hammett, Virginia Tech, who leads summer programs in Central America; JoAnn Beckwith, Michigan State University, who leads summer programs in Australia; Geoff Habron, also of Michigan State University, who leads a summer program in the Brazilian Amazon; Bruce Bongarten of the University of Georgia, which offers several month-long courses in conservation issues, including one to South Africa; Kim Steiner of Pennsylvania State University, which has an exchange study program with Freiburg University in Germany; Gary Blank and Steve McKeand, NC State University, who coordinate an exchange study program with SLU in Sweden; and Ingrid Schmidt and Kristi Hubbard of the NC State Study Abroad Office. My experience with international natural resource education is designing and leading spring-break trips to Latin America. We also had input from many other faculty who have led—or are planning—study programs in natural resource issues around the world.

Everyone in the session agreed that students find short-term study programs to be “wonderful experiences.” Some faculty require students to keep trip diaries, and these often suggest that the programs are truly “life-changing.” Students gain independence, confidence, and a new appreciation for the quality of life in the United States (such as the easy availability of clean drinking water). Firsthand experience with natural resource issues in other countries enhances students’ respect and understanding for different approaches to natural resource management. While the programs are always extremely “educational,” panelists noted that faculty must plan carefully to ensure that there is also “academic” content. This content can be enriched by making use of the great multitude of resources that are available at the destination—this is what makes the programs as exciting for teachers as they are for students.

Panelists disagreed on how much cost affects students’ decisions about participation in these programs. Some noted that motivated students find a way to pay for even relatively high-cost programs. Others argued that keeping the cost down is a major concern. Strategies include seeking in-kind support from forestry and other natural resource industries in the destination country, using campgrounds rather than hotels, and running study programs as an exchange. For example, PSU and Freiburg host study programs for each other; thus, in both Germany and the United States, knowledgeable local hosts make the logistical arrangements and prevail on colleagues to contribute their expertise to the programs. Nevertheless, there are always cost factors that are difficult to control, such as variation in exchange rates.

Study programs run on an exchange basis are one way of “giving back” to hosts (by arranging their study tour of the United States). Other panelists noted that their student groups had volunteered at bird observatories or with cleanup drives in communities. In most cases, the student groups gain as much, if not more, from these volunteer activities as the local people. In fact, several faculty see the “community service” components of their programs primarily as a way to encourage student interaction and communication with local people. Others indicated that the ethics of tourism and of their study tours is a central issue for discussion during their programs, with students challenged to think critically about their impact on local environments and people. The degree to which students can make a meaningful contribution and build meaningful relationships with local people may depend on whether the study tour is organized around a base, as opposed to being structured as a series of stops in different locations. One suggestion that could apply to either of these models is to solicit local people's input on the design of student activities. For example, rather than just hiring local people as guides, ask them to plan the students’ visit to their village. One caveat raised was that in some cases, it might be best to forego interaction with local people, for example, some aboriginal people in Australia.

Another facet of the ethics of study-abroad programs is bringing the benefits back to campus, to share with students who are not able to participate directly. It is important to recognize student sensitivities surrounding the issue of who gets to participate in study-abroad programs. Students who have jobs, family commitments, or course schedules that prevent their participation may resent this missed opportunity. Alternatives for these students could include enhanced interaction with international exchange students on campus and study tours to locations within the United States that have local cultures and environmental resources outside the students' current range of experience. The NC State Study Abroad Office has a system of peer presenters, whereby students who have returned from study-abroad programs visit on-campus courses and student clubs to talk about their experience. In the Department of Forestry at NC State, students give departmental seminars reporting on their experiences overseas. Another possibility is to embed the study tour as an optional "lab" in an on-campus course and to draw on the experience of students who chose the study tour through group projects and class discussion. A final suggestion is to build contacts between students at the home campus in the United States and at foreign institutions visited during a study tour; for example, by encouraging e-mail communication as a way to extend some of the intercultural benefits to students in both countries who could not participate in the study program.

The panel concluded with discussion of some of the logistical issues involved in planning and leading study-abroad programs. In general, the panelists agreed that there is continuing, strong student interest in these programs and that the logistical challenges of international travel are surmountable, even in the changed international climate. For example, visas may take longer to obtain, but they are still obtainable. The importance of coordination between the faculty trip leader and the university was emphasized, with two-way communication and clear contingency plans a must. All agreed that we should seek ways to expand cooperation and coordination between universities, so that we can continue to provide our students with the many benefits of these programs, while reducing the burden on individual faculty. This discussion will surely continue outside the conference and at the next UENR.

MAKING THE TRANSITION FROM PASSIVE TO ACTIVE EXPERIENTIAL LEARNING

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ABSTRACT: After some introductory remarks, which will include identification of key words in addition to those in the title, the participants will get together in groups of 3-4 to identify an idea that has worked for them within the framework of the title. If they have no experience to share, then the group will formulate a question to present for discussion. After about five minutes of these small-group meetings, one person from each group will present their main idea or question (in a minute or so) and a list will be made of all these ideas or questions. Then discussion will ensue by the whole group concerning the items on the list, with a summary at the end of the main points. The intention is to conduct an active, cooperative, experiential, interactive, integrated, participatory learning session.

RECAPTURING THE WONDER IN NATURAL RESOURCES: PERSPECTIVES FROM A COMMUNITY OF LIFELONG LEARNERS

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ABSTRACT: We will present various perspectives of natural resource learning journeys experienced by faculty, student, and staff members of the Bailey Scholars Program within the College of Agriculture and Natural Resources at Michigan State University. The Bailey Scholars Program seeks to be a community of scholars dedicated to lifelong learning. All members of the community work toward providing a respectful, trusting environment where we acknowledge our interdependence and encourage personal growth. Individuals will share their experiences and nurture a conversation regarding the challenge and opportunities of building learning communities. We invite others to come share their journeys and discuss opportunities for fostering learning in higher education that value and encourage the wonder and enjoyment of the environment that brings us to the field initially. The experiences we share range from the informal to the formal. Questions: (1) What brings us to natural resources? (2) How can we pursue learning without snuffing out the natural wonder that brought us to our interest in natural resources and the environment? Topics: A. Experiencing the wonder of nature. B. Lost and found on campus. C. Bringing compassion and creativity to the classroom. D. What's grading got to do with it? E. From teaching to learning: freshmen, study-abroad, and graduate experiences. End Result: i. Identify learning experiences that maintain the joy and wonder that originally brings people to the natural resources field. ii. Discuss potential strategies to improve learning experiences in various circumstances.

This will be a two-part session. We'd like to try a structured approach on the first day of the conference by sharing our experiences to give people some food for thought. After the session we'd like to encourage participants to write down experiences or discussion topics on a publicly available space. (See page 31.)

THE ROLE OF CIVIC RESPONSIBILITY IN LEARNING AND THINKING ABOUT NATURAL RESOURCES

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ABSTRACT: Often, students disassociate their role as citizens living in a democracy from their current role as students and, eventually, their role as natural resource professionals. There is a need in natural resources education to *re*-associate these roles. The question is how to do it in a way that is meaningful to students. In 1999, the Colleges of Natural Resources and Education and Human Development at the University of Minnesota embarked on a three-year project with the Hong Kong Institute of Education to develop educational programs related to civic responsibility, moral development, and environmental and natural resources education. The project was begun in response to Hong Kong's status as a special administrative region of China. It was designed to look at the role of education in building a new democracy. Environmental education was selected as a specific type of education that could be looked upon as a catalyst for getting people (ordinary citizens) involved in shaping policies that would affect their lives. How were the lessons learned in China used in natural resources

education in the College of Natural Resources at Minnesota? During Fall semester 2001 a freshman honors colloquium in the College of Natural Resources was designed to expose students to a variety of natural resource and land-use concerns occurring at the rural/urban interface. Specifically, the course—"Sprawl, Smart Growth, Sustainability and Civic Responsibility: the Rural/Urban Interface"—was designed to help students: (a) identify natural resource concerns at the rural/urban interface; (b) appreciate that addressing these concerns is an interdisciplinary process; (c) understand that despite the best scientific knowledge we have at any point in time, in the end, natural resource and landscape decisions reflect societal values; and (d) describe a process for achieving smart growth and sustainable places that includes the biophysical component, values individuals' place on the landscape, and decisions individuals and society make given the knowledge and values they bring to bear on the issue at hand. In this class, students decide the kinds of knowledge and skills needed in the nation's citizenry to successfully address natural resource problems. Based on the skills they select as most important, they decide on and build a course reading list. To understand how the role of citizen and natural resource professional are associated, they engage in a variety of learning experiences in the real world with real-world decision makers (e.g., mayors, city councils, planning commissions, state agency natural resource professionals, advocacy groups, land developers). Students evaluate the process they have followed in the course, their experiences in the course, and the impact they believe it will have on their education. In other words, do they see this type of learning experience as one that helps them to understand the link between their education and building an informed and involved citizenry?

TEACHING RESTORATION ECOLOGY AS IF THE COMMUNITY MATTERED

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ABSTRACT: A client-based experiential learning activity was integrated into an upper-division restoration ecology course, imparting a practical understanding of ecological restoration to students while providing meaningful service in response to client-expressed needs. Typical clients represented community conservation interests. A multidisciplinary team approach was developed that linked the classroom to the larger community in several ways. (1) The service performed by the students flowed from the course objectives and directly addressed a real need of the client. (2) The client articulated the need and project objectives. (3) Client interviews, juried oral presentations, and a written report provided structure for students to assimilate project experience and course objectives, and served as one basis for performance evaluation. (4) Assignments and course organization gave students opportunities to practice the group skills that are crucial in many organizations. The learning process addressed real problems; required teamwork, responsibility, and effective communication; and incorporated input from professionals. Based on assessment instruments; comments from clients, students, and jurors; and instructor observation and reflection, it is concluded that experiential learning offers practical solutions to the client while enhancing student learning, encouraging mutually beneficial community ties, and helping prepare students for careers in disciplines that involve public interaction.

PROFESSIONAL WRITING FOR A NATURAL RESOURCE POLICY COURSE

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ABSTRACT: Writing, there's no doubt, is important to anyone's career. Natural resource professionals, whether in agencies, nonprofits, academe, or in private practice have a need to express themselves in a cogent and succinct manner. In a "Natural Resource Policy" course students learn the skills of critical reasoning, conciseness, and editing with a variety of assignments that compel creativity and problem solving. Over the semester students write several letters to the editor, letters to a client, memoranda, opinion pieces worthy of the *Wall Street Journal*, and briefing papers of less than five pages. For each assignment, students identify a co-editor, someone who reads and actively comments on the assignment prior to its being turned in to the instructor. Co-editors are also required to initial all assignments to demonstrate their acceptance of revisions. Students learn that what they say has import and that peers are often the best critics. Writing assignments stimulate critical-thinking skills and improve written communication. Students are evaluated on spelling, how well they follow instructions, editing, and explanation of subject matter. A variety of written tasks that reflect real-world problems strengthen student communication skills.

RHETORIC ASSOCIATES IN NATURAL RESOURCES: INFLUENCES ON UNDERGRADUATE EDUCATION AT UTAH STATE UNIVERSITY. PART I: FUNDAMENTALS OF THE PROGRAM AND INFLUENCES ON MENTORS

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ABSTRACT: Started in 1990 in the College of Humanities, Arts, and Social Sciences at Utah State University, the Rhetoric Associates (RA) Program provides an opportunity for undergraduate mentors to assist their fellow students in developing their communication (mostly writing) skills by working with them on assignments designed by faculty in specific courses. RAs read first drafts of assignments, make suggestions for revisions, and meet with students one-on-one to discuss the revisions. Faculty then read the revised drafts for a final evaluation of student performance. RAs were first assigned to courses in the College of Natural Resources in 1994, and in most cases were majors in the college and had taken the course to which they were assigned as an RA. Surveys of current and past RAs indicated a number of benefits derived from this experience, including: (1) enhanced skills in the areas of organization, interpersonal communication, mentoring and teaching, editing, adaptability, and self-analysis; (2) satisfaction from helping fellow students and faculty; (3) enhanced résumé and, in turn, employability; and (4) recognition by others.

RHETORIC ASSOCIATES IN NATURAL RESOURCES: INFLUENCES ON UNDERGRADUATE EDUCATION AT UTAH STATE UNIVERSITY. PART II: INFLUENCES ON STUDENT RECIPIENTS AND FACULTY

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ABSTRACT: Surveys of undergraduate students in the College of Natural Resources at Utah State University who were mentored by their fellow students in the Rhetoric Associates (RA) Program suggest improved writing and critical-thinking skills, students' ability to take constructive criticism, and clarification of expectations of the course instructor. Surveys of faculty teaching courses to which RAs have been assigned indicate improved writing skills and greater focus on the content of written assignments, reduced demands on the instructor's time, increased satisfaction from working with talented undergraduate mentors, and benefits associated with RAs serving as mediators.

USING GEOGRAPHIC INFORMATION SYSTEMS AS A COMMON GROUND FOR DIALOGUE ABOUT WATERSHED STEWARDSHIP

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ABSTRACT: To help prepare professionals for leadership positions in watershed stewardship, the Center for Watershed Stewardship (CWS) at Penn State University has adapted GIS for use in its curriculum. The GIS is used as a common ground for communication between graduate students representing several departments or programs in an interdisciplinary, yearlong Keystone Project. The Keystone Project group works with a community organization to produce a watershed stewardship plan. Currently, Environmental Systems Research Institute (ESRI) ArcView 3.2a and 8.1 and several extensions are used routinely. Arc/Info 8.1 is also available for more complicated analyses and data management. This software is available in a dedicated computer laboratory with a 100-megabit network connecting 8 desktop and 2 laptop computers, with a dedicated geo-database and print server. CWS has committed funding for a teaching assistantship to support the computer operations and provide technical support. Students in the program come with varied GIS experience. Students have the option to take several GIS courses around the university and via CWS-sponsored short courses offered to professionals in business, government, and the nonprofit sectors. The students help each other to learn how to work with the data to develop a story of the watershed of interest, reinforcing a collaborative learning environment.

USING GIS AS A WATERSHED MANAGEMENT EDUCATION TOOL

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ABSTRACT: Global Information Systems, including the capacity of these systems to store and manipulate data, have found great utility in analyzing spatial information. The spatial information that is most useful to watershed managers includes accounting of land-use practices that both damage and enhance water quality in watersheds. The capacity of GIS to present data visually is very helpful when trying to educate those concerned with watershed management issues. Using GIS techniques, data may be presented as a series of overlays that include watershed area, stream channel network, topographic relief, aerial photos, vegetative maps, soil types and stream-side management zones (riparian buffers). GIS, and associated software, have the capacity to zoom in or out so that the viewer may have a watershed-scale view as well as site-scale observation. Spatial data from 20 years ago may be compared with that of this year so that changes through time may be observed on such important watershed characteristics as riparian zones width and growth of impervious surfaces. Queries (questions) may be asked of the data to determine information such as the number of Confined Animal Feeding Operations in the watershed. Land ownership may also be determined. As data sets are developed for watersheds, land managers of watersheds will be able to use models to predict how land-use changes will impact water resources within watersheds. Examples of these GIS applications will be provided in this paper.

MAPPING FOREST COMMUNITIES USING GPS AND GIS

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ABSTRACT: Students in a general education, general ecology class collect vegetation data within a national park and prepare forest community maps using ArcView. Students locate sample points using map and compass skills and then collect appropriate vegetation and GPS data at each sample point. They prepare community maps using ArcView 3.2. Challenges and successes encountered in developing and implementing this activity are described, student maps demonstrated, and activity handouts provided.

ENCOURAGING CRITICAL THINKING ABOUT ADVOCACY

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ABSTRACT: Advocacy is a common topic in the literature. All graduates in natural resource sciences will have to face decisions regarding advocacy at some time. Unfortunately, we do little to prepare them for those decisions. Much of the literature says either we all must be advocates or none of us should be advocates. The reality is that there are jobs for people who want to be advocates and jobs for people who don't. It's crucial that

students start to think critically about the role they want advocacy to play in their future. In this workshop we will introduce the participants to an exercise that quickly moves students beyond avoiding advocacy to a point where they relate it to their own values. Objectives are to (1) Discuss how advocacy is portrayed in the literature; (2) Discuss how students think about advocacy; (3) Discuss what should be our goals regarding advocacy and students; (4) Present methods and exercises to encourage students to think critically about advocacy; and (5) Discuss alternative approaches. Audience participation will be ensured because we will break into small groups (about four people per group) and do an exercise requiring everyone's involvement. As this is such a controversial topic, it is bound to bring nearly everyone into the discussion. The discussions will be facilitated to encourage everyone's participation.

TEACHING AND LEARNING IN CONTEXT IN NATURAL RESOURCES SCIENCE AND MANAGEMENT

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ABSTRACT: A vast body of research from education, psychology, and neuroscience suggests that learning is highly context dependent, acquired through experience and involvement in real-world situations. In contrast, traditional teaching methods often disassociate learning from meaningful contexts, and students spend more time passively watching and listening than actually doing. Exclusive use of methods like these is particularly inappropriate in natural resources science and management, because of the professional orientation of these curricula. This workshop will explore three related teaching strategies that promote learning through engagement in real-world contexts and situations: role-play, case studies, and problem-based learning. Participants will identify what learning outcomes each strategy best facilitates; learn how to plan and implement each strategy, including proper facilitation techniques; evaluate the applicability of each strategy to their own courses; and compare and contrast the strengths and weaknesses of each strategy.

FOSTERING CREATIVITY IN THE ENVIRONMENTAL CLASSROOM: SEEKING CREATIVE SOLUTIONS THROUGH ACTIVE PARTICIPATION

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ABSTRACT: Complex environmental issues and constant change call for creative and innovative solutions. We believe critical thinking in the area of environmental studies is imperative both in and out of the classroom. Exercise: "Creatively Controlling Campus Crud: Design a Better Pizza Box." This is a multifaceted exercise that we created and currently use in the core environmental studies class in the Department of Resource Develop-

ment at Michigan State University. This exercise provides space for creative approaches to the complex environmental issue of waste on the campus. Discarded pizza boxes are the number one cause of waste on the MSU campus. Their volume and the contamination of the cardboard with food waste cause the problem. We have created this exercise to show how students contribute to a significant environmental problem, yet we provide them the space to offer their own solutions to the problem. They then quickly present their designs and thoughts to their colleagues in the class. This exercise provides space for lateral thinking: The worldview of students is represented in how they frame the problem from actually designing a new pizza box to questioning consumerism (concrete to abstract). Students begin to understand how they contribute to environmental degradation by their own worldviews and behaviors. Students also discover how they can have impact and develop innovative solutions. This exercise also gives students practice in first critically examining their own worldviews and values, observing creativity in action, working with others to frame the issue, and thinking of creative ways to address complex environmental issues in a safe space.

INTRODUCTION

Complex environmental issues and constant change call for creative and innovative environmental solutions. We believe critical thinking in the area of environmental studies is imperative both in and out of the classroom. Therefore, we designed an exercise around the concept of “Controlling Campus Crud Creatively: Can You Design a Better Pizza Box?”

This is a multifaceted exercise that we created and currently use in the core environmental studies class in the Department of Resource Development at Michigan Sate University. This exercise provides space for creative approaches to the complex environmental issue of waste on the campus. Discarded pizza boxes are one of the biggest causes of waste on the MSU campus. Their volume and the contamination of the cardboard with food waste present a problem.

We have created this exercise to show how students contribute to a significant environmental problem, yet we provide them the space to offer their own solutions to the problem. They then quickly present their designs and thoughts to their colleagues in the class. This exercise provides space for lateral thinking. The worldview of students is represented in how they frame the problem from actually designing a new pizza box to questioning consumerism (concrete to abstract). Students begin to understand how they contribute to environmental degradation with something as familiar as a pizza box. Students also discover how they can have impact and develop innovative solutions. This exercise also gives students practice in critically examining their own worldviews and values while observing creativity in action. They work with others to frame the issue and think of creative ways to lessen or resolve complex environmental issues in a safe academic space. Plus, it’s fun.

Our assumptions about creativity are that

- Everyone is creative—some more than others;
- As a result, instructors need to create a time and space for creativity to emerge in the classroom; and
- Natural resource problems are complex, so the need for creative solutions is great.

Designing a Better Pizza Box is one activity we’ve used to foster creativity.

STEPS OF A CREATIVE PROCESS

1. To start the pizza box activity, we divide students into teams of three or four students. Our class generally has 25 to 35 students, so we end up with eight to ten teams.
2. Our pitch is that we have a 20-minute video on the creative process. So, it’s a movie day and they should sit back and enjoy. To help relax, we’ve ordered pizza and soft drinks as a treat.

3. The video is called *The Deep Dive*, a recent “Nightline” program with Ted Koppel. It explores the creative design process that has been developed by IDEO, the California design firm. (IDEO’s approach and the making of the “Nightline” program have been described in Kelley, 2001.)
4. Students watch as the IDEO team (a dozen professionals from diverse backgrounds) playfully goes through the creative process of redesigning a grocery-shopping cart. The IDEO teams first identify significant problem areas with existing carts including safety, theft, and limited mobility. One participant also noted, “They are ugly.”
5. Next, the IDEO team brainstormed new design ideas with encouragement from the “boss” to think of “far out” solutions so that they might recognize the range of ideas and adjust to what might be more realistic.
6. Then, after the brainstorming session, the IDEO group split into teams and went out into the real world to talk to the “experts”—people who frequently use shopping carts and who know about problems with safety and design. Some have called this “doing the truth,” field work, or talking to the “Buzzes” of the world. In short, it is seeking out the experts who may have spent years learning about the problem first-hand.
7. Finally, the IDEO teams returned to their home base, shared their newfound knowledge about how shopping carts are actually used—and misused—and began to design their own shopping cart. The whole process took five days. The process was playful; it incorporated wild ideas, and was extremely creative. The teams’ mock-up later won a design award. Their innovative process has been showcased many times.

OUR PIZZA BOX DESIGNS

The students in our class seem to be inspired by the video, and they enjoy the pizza. This is natural because our class is conducted in the late afternoon, and they are hungry, pizza-loving college students. So, 20 minutes into class, they find themselves sitting in small teams smiling at an empty pizza box.

We say, rather quickly, creative design can also help the environment. One of the biggest waste management problems on our campus at Michigan State University is pizza boxes—lots and lots of them. They currently can’t be recycled because pizza remains contaminate the cardboard. “Your team’s assignment for the next 15 minutes,” we challenge them, “is to design a better pizza box.”

We have them draw their ideas on an overhead transparency. In the last 15 minutes of class, each team stands and makes a brief presentation of their creative solutions—wild, wacky, and wonderful.

We give students “permission” to be creative, provide some “how-to” tips on creative processing, give them the opportunity to present their ideas to the rest of the class, and foster the beginning of teamwork skills within our class. Over the past few years, we have collected some fantastic ideas about improving the box, eliminating the box, or changing our Western ways of consumerism.

Some instructors may find creativity to be one of those grandiose topics that can be rather intimidating, like belief systems or ethics. As instructors, we generally appreciate it when we see creative papers or projects, but we seldom specifically address creativity. Through our “Design a Better Pizza Box” exercise, we provide the time and the space for students to creatively solve complex environmental problems. Plus, it’s fun!

CONCLUSIONS

Officially our course is entitled “RD 200: “Issues and Applications in Resource Development.” It is intended to introduce students to the conceptual nature of resource management. It also offers an opportunity to think in a multidisciplinary way about complex, real-world issues.

Course work in RD 200 involves writing, reflecting, and class participation. Students write individual weekly papers and reports for assigned group projects. The class is an active learning experience for the students, and class participation is strongly encouraged. Students’ contribution to the course is an essential part of their individual and our collective learning process.

The main goal of the course is to improve students’ environmental and natural resource problem-framing and problem-solving skills. Overall, we believe that

1. People are part of the solutions to environmental problems;
2. Understanding other people’s views is important; and
3. Creativity is critical in finding new solutions.

The pizza box exercise fosters the creative process and allows students to share their creative solutions. Our class time is interactive and learner-centered. We also try to make learning fun.

As Bob Samples (1976, p.102) once said, “If I criticize others for re-inventing the wheel, I am probably more interested in wheels . . . than inventions.” In our class, we applaud the inventions and the inventors.

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AN ELECTRONIC PERFORMANCE SUPPORT SYSTEM (EPSS) FOR NATURAL RESOURCE PLANNING: MAKING THE LIMITS OF ACCEPTABLE CHANGE (LAC) SYSTEM INTERACTIVE

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ABSTRACT: End-users in academe, as well as in professional practice, are increasingly looking toward advances in distance education to improve learning opportunities for students and staff. The Internet has provided one medium for delivering information to global users in a dynamic environment. Unfortunately, the restrictions of the Internet (in terms of server connectivity, bandwidth type, and data processing capabilities, etc.) often limit the flexibility for delivering and working with large multimedia and interactive files. An alternative platform to the Internet is the digital video disk (DVD), which is capable of storing, delivering, and processing large pieces of information almost instantaneously and without the system requirements of the Internet. This presentation will demonstrate the application of an electronic performance support system (EPSS), delivered via DVD, to wilderness planning using the Limits of Acceptable Change (LAC) system. An EPSS is a computer-based training approach that provides integrated, on-demand access to (a) information (e.g., multimedia and statistical databases), (b) tools (i.e., productivity software, such as a word-processing document), (c) advice (a coaching facility that guides users through performing procedures and making decisions), and (d) learning experiences (i.e., interactive tutorials) (Gery, 1991, ctd. in Leighton, 1998). It enables a high level of job/task performance with a minimum of support from others, thus reducing the need for wilderness planners to attend expensive training sessions and be away from their job for extended periods of time. The LAC EPSS utilizes a “just-in-time,” real-world, and task-oriented approach to problem solving and guides wilderness planners through the nine steps of the LAC system in an interactive manner. The interactive tasks involve a series of feedback loops developed using empirical data of biophysical and social conditions (including, for example, vegetative conditions, soil erosion, campsite conditions, trail depth, etc.) and multimedia applications (i.e., digital video and photographs) of biophysical and social conditions. The LAC EPSS is demonstrated using the context of Raven Cliffs Wilderness Area in the southern Appalachian Mountains of north Georgia.

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A COOPERATIVE APPROACH IN GPS TRAINING

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ABSTRACT: As Global Positioning System (GPS) technology becomes more commonly used in many aspects of natural resource management, the need for education and training in this area has also increased. However,

the high cost of the equipment and the high level of technical knowledge required has been a barrier to including GPS in forestry and other natural resources curricula. This fall the forest technology program at Penn State-Mont Alto and the Bartlett Tree Experts Company collaborated on a two-day training session in GPS using Trimble receivers and data collectors. Ten students and faculty from Mont Alto and ten Bartlett personnel participated in the program. The first day of field procedures and data processing was taught by a Trimble-certified trainer. The second day consisted of training by Bartlett Tree Research Laboratory staff in Bartlett's tree inventory system and management plan writing. As a practical project over 400 trees in the campus's arboretum were inventoried with the Bartlett tree inventory and appraisal system. The workshop was mutually beneficial to both groups. Bartlett was able to train its personnel in a well-equipped computer lab and typical landscaped environment on campus. The university students used the latest equipment and were able to get career and practical insights from arborists employing the technology in the field. The combined efforts of all the participants in the tree inventory facilitated a long-standing need in the arboretum's management. Sharing resources in joint training exercises such as this one provides a realistic teaching opportunity in a time of budget restraint.

FINDING BALANCE IN THE EDUCATIONAL SYSTEM: A PROBLEM- BASED LEARNING EXPERIENCE

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ABSTRACT: In the early 1990s the faculty of Forestry and Environmental Management became aware of the inability of students to integrate what they had learned and their inability to apply it (Zundel et al., 1994). Industry was telling them that they required graduates that were good problem solvers. At about the same time, faculty members were reading a book entitled *Educating the Reflective Practitioner*, by Donald Schon. The book suggests that professionals should be engaged in a process of thoughtfully doing things or reflection-in-action. As a result the faculty became interested in problem-based learning.

Problem-based learning was attractive because students learn by engaging in a process of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Students are given a carefully prepared "presenting problem." Presenting problems are ill-defined, opened-ended problems that lack concrete information. Once the students have the problem, they analyze the problem, define needed information, identify new knowledge, and apply the new knowledge to solve the problem. As they are doing this they are building their expertise in problem solving and building teamwork skills.

Problem-based learning was implemented across the five-year curriculum. The students hated it. For a number of years the students appeared confused, disoriented, and angry. They complained that the problems were insurmountable and that they lacked the resources to find solutions to the problems. Academic and emotional support was provided to encourage students to succeed. The grievance process model was introduced so that students could understand why they were feeling the way they were, to show there was light at the end of the tunnel. Though many students adapted quickly to the new approach to learning, some were simply unwilling to cope with the new approach to learning and the difficulties associated with it.

As a result, the faculty adopted a simplified educational model to try to understand why students hated problem-based learning (Needham and Zundel, 2000) (Figure 1).



Figure 1. Simplified Educational System Model

Characteristics of each of these components were examined to help understand the problem. Characteristics identified within each component consisted of the following:

- Student: educational background, maturity level, and type of previous learning approach.
- Program: presenting problem, class sizes, skill level of faculty, quantity and the quality of available resources, and quality of feedback.
- Outcomes: the professional, technical, and attitudinal outcomes desired.

It was found that our expectations of our students were entirely realistic. The model we had implemented was appropriate for highly motivated, exceptionally smart students. This represented perhaps twenty percent of our total student population. As a result of this investigation many aspects of the delivery of problem-based learning were modified to fit our needs and circumstances. I am presenting only one of the modifications that were made.

The presenting problems in our first-year freshman course were modified to be less open-ended and ill-structured. The nature of the problems was also modified to be more technical so that there was much less ambiguity for the student to struggle with (Figure 2).

In 1994 the student would spend time struggling to determine what was meant by value. Students would be engaged in defining value, learning what value meant, from whose perspective, and how it could be measured. Although there was feedback and interaction along the way, the students final report was due two months after it was initially given. The presenting problem in 2001 was much different. It emphasizes technical skill development and does require the same amount of questioning to determine a practical solution. The duration of the project is also significantly less than the initial presenting problem.

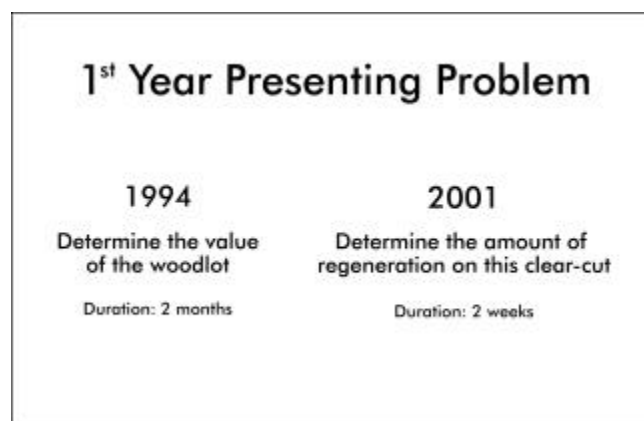


Figure 2. First-Year Presenting Problems from 1994 and 2001

As a result of this change and others, the program is much better balanced. Students are not experiencing the same levels of stress, yet are still meeting our targets for technical outcomes. But are there consequences to our initial 1994 and 2001 objectives?

There is a possibility that students are not as comfortable in the attitudinal outcomes. They may not be as compe-

tent at handling high levels of stress, coping with change, taking the initiative, and learning on their own as graduates from the first years of problem-based delivery. There are no concrete data to support this belief at the moment, however.

If you are considering or have already implemented problem-based learning in your program, I suggest adopting this simplified educational model and examining the characteristics of the three components carefully. Realize that a modification to any of the components impacts the other components and should be considered for such impact before being implemented. Also, keep in mind that there can be hidden trade-offs to changes that may be as important to the success of the students as some of the defined outcomes you are striving for.

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TEACHING FOREST MEASUREMENTS ONLINE: AN OVERVIEW OF THE INITIAL EXPERIENCE AT THE UNIVERSITY OF ARKANSAS-MONTICELLO

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ABSTRACT: A 3-credit, online forest measurements course designed for sophomore-level students was created and taught for the first time during Fall 2001 in the School of Forest Resources at the University of Arkansas-Monticello. Narrated PowerPoint® presentations saved in html format were used to deliver the lecture material. An overview of the course material, the time required preparing the course, and issues that should be considered by first-time online instructors are discussed. All things considered, the course was a success despite the heavy upfront workload and technical issues encountered.

INTRODUCTION

The forest measurements class at the University of Arkansas-Monticello School of Forest Resources consists of a 3-credit lecture class and an associated 1-credit laboratory. This sophomore-level course has trigonometry and dendrology prerequisites and is part of the core curriculum for both the forestry and wildlife management Bachelor's degree programs. The lecture course encompasses basic forest measurement concepts including introductory statistics, land survey and compass use, quantifying volume and weight of logs, standing tree and other forest measurements, wildlife population sampling, habitat evaluation, and fixed and variable radius plot sampling. The author taught the course twice in a traditional classroom setting prior to re-tooling the 3-credit lecture course as an online course.

During the Fall 2001 semester, the lecture portion of the course was taught online for the first time. This course was targeted for online delivery to serve three main purposes: (a) allow transfer students to take this course at another institution prior to transferring to the Monticello campus; (b) increase the frequency at which the course is offered on the Monticello campus from once a year to twice a year; and (c) serve as a leveling course for incoming M.S.-level graduate students in need of a forest measurements background. This paper outlines course development and implementation in order to assist others who may be entering the online teaching arena for the first time.

LECTURE FORMAT

Three formats were considered for presenting the online lectures: text- and image-based Web pages, streaming media, and narrated PowerPoint® presentations saved in html format. Text- and image-based Web pages, while easily designed, were not chosen due to the static nature of such presentation. It was felt that some actions, no matter how small, by the student were needed to maintain attention to the material at hand. Streaming media, while possible, led to technology-based difficulties: The same files would not behave similarly on various computers. In the absence of formal technical support, it appeared that streaming media, while efficient with respect to file size as well as Internet connectivity (modem versus Ethernet), was not a viable option in this particular circumstance. Therefore, narrated PowerPoint® presentations saved in html format were chosen as the method to use for lecture delivery.

PowerPoint® presentations are easily saved in html format within PowerPoint® via the “Save As” menu option. As long as the individual creating the presentations employs the built-in slide formats, the titles of each slide will appear in list format down the left side of the split-frame Web page that is created. This user-friendly format for switching from slide to slide (mouse click on the different titles) on the resulting Web page is automatically built via the software.

Audio files were created using an inexpensive Labtec® headset-mounted microphone and the Sound Recorder accessory standard in Microsoft Windows® and saved as .WAV files. If desired, Windows Media Encoder® is freely available to convert .WAV files to .WMA audio files for streaming. Again, streaming audio was not used in conjunction with this particular online class.

The audio files, each about 1 to 1.5 minutes in length, were linked to pictures within the PowerPoint® presentations as “Action Settings.” The “Action Setting” option is a pop-up menu available by using the mouse to right-click on the image to which one wishes to attach the audio file. The audio file will be set up to play based on the mouse action chosen from the menu: either a mouse-over of the image or a mouse click on the image.

Each lecture was about 15-25 slides in length so as not to overwhelm the students in any given lecture. Each slide had its own audio file. A total of 46 online lectures were created from the course notes used when teaching the traditional classroom format. About 850 slides and thus 850 audio files were created in total. This led to approximately 1,275 minutes of audio associated with the online lectures. Interestingly, the traditional classroom version consists of 45 lectures (and 3 tests, thus equaling the 48 lecture meetings common to a 3-credit lecture course in a 16-week semester). Since each traditional classroom lecture features about 30 minutes of “talking time” (and thus 20 minutes of writing time), the traditional classroom version includes about $30 \times 45 = 1,350$ minutes of “talking time,” or just about the same as the online version.

MANAGING THE COURSE

BLACKBOARD® software was used to manage the online class during its initial offering, though WebCT® will be used in subsequent offerings because of institutional policies. No recommendation of any particular program is offered. Rather, the importance of using such software is what should be stressed. The various features of any particular courseware package (discussion boards, announcements, e-mails, etc.), while obviously important to any online offering, are not covered herein. Readers are directed to the software itself for respective features and software-specific training.

Tests were not given online. Tests were taken in a traditional classroom setting. Institutional Web instability and concerns with respect to the potential for cheating led to this decision. Homework assignments were made available over the Internet and submitted to the instructor via e-mail attachments.

Institutional Web instability also led to providing the lectures to students on CDs in addition to their availability over the Internet. The lectures fit onto a 2-CD set (each lecture is about 25 MB in size). An Ethernet connection was required to efficiently view the lectures online; transmission via a modem was painfully slow because of the .WAV format of the audio files. Providing the lectures on CD to the students alleviated this issue.

KEEPING THE ONLINE LECTURES INTERESTING

Prevalent thought was to keep students engaged in each online lecture and to keep the lectures lively and interesting. Frequent interaction to keep the lecture moving and additional features, as outlined below, were added to ensure students would in fact continue to visit the lectures whether students were truly passionate about the material or not.

In order to keep the online lectures interesting, each lecture had its own theme with respect to color pattern, font, etc. An image of a character dubbed “Ranger Paul” appeared on the first slide of the lecture and was the image on which to mouse-click to hear the associated audio within that lecture. That image appeared on each slide of that lecture, and was located in different locations from slide to slide. An oddball slide was added from time to time to surprise students. Similarly, unusual audio was included from time to time to serve the same purpose.

Requiring the student to actively mouse click from slide to slide and to actively click on pictures to hear the audio engaged the students to keep the lecture flowing. Frequent subject-matter-based problems were provided to students within the lectures to allow them to assess their understanding of what was presented. Answers to some of the problems were provided; others were not but could be obtained from the instructor.

COURSE ACCEPTANCE

The online version of forest measurements lecture was extremely well received by the small class size enrolled in its initial offering. Initial enrollment was limited to a handful of students due to the vast number of unknowns that potentially could have occurred during the initial offering. Students appreciated the chance to review lectures time and time again when needed to comprehend the material. Class size will not be limited in the future now that the initial offering was successful.

Students enjoyed the variety of lecture themes offered to them based on the various images of the Ranger Paul character. In fact students would refer to the individual lectures based on the image of Ranger Paul rather than the subject matter, so a connection was obviously made.

From an instructor’s perspective, traditional stumbling blocks with regard to certain subjects within the course were avoided. Students seemed to comprehend these specific subjects better once given the opportunity to review the lectures. Also, students tended to ask better phrased and more informed questions in conjunction with the online version (when compared to the traditional classroom version) indicative of a better basic understanding of the material afforded by the online lectures.

WORKLOAD

While the course was indeed successful, it did not come about without a price. About 350 hours were required to re-tool the forest measurements lecture course for online delivery. Each traditional lecture took about 7-8 hours to convert to the online format. Nearly 250 digital images were taken (Sony Mavica® and Kodak DC200 Plus®

digital cameras were used) with respect to course content in addition to the Ranger Paul images. It is hoped that the workload required to develop the course will be recouped with respect to traditional classroom lecture time saved based on future offerings.

SUGGESTIONS AND OBSERVATIONS

A variety of suggestions and observations are offered with respect to this initial online experience. They are provided in list format below in no particular order.

1. Remember that delivering online lectures is more than just providing notes—there should be interaction to keep the student engaged.
2. Providing students with the option to review lectures improved comprehension level. A traditional lecture is a one-time event; an online lecture can be viewed repeatedly without overburdening the instructor.
3. Keep the online lectures interesting, perhaps in ways unrelated to the subject matter. Doing so will ensure students will look at all lectures regardless of their level of passion with respect to the subject matter. Having fun is advisable.
4. Scripts were originally written and then read when recording the audio. However, trial and error eventually led to recording audio sentence by sentence and not using a set script. Each sentence was reviewed prior to proceeding with each .WAV file recording. It was simply more time efficient to employ this technique as opposed to reading the written scripts. As a result, a microphone with an on-off switch is highly recommended.
5. Audio files were linked to images using the “mouse-click” rather than the “mouse-over” option. This method was chosen to reduce the chances of accidentally starting an audio file while viewing an online lecture.
6. Frequent course related problems should be provided to students to give them the opportunity to assess their knowledge before proceeding with the same or another lecture.
7. About 250 digital images were taken in conjunction with this course. In retrospect, more were probably needed. The more images, the better.
8. A general rule of thumb is that it takes about 6 months to create an online course.
9. Try not to create and teach an online course in the same semester. Granted, this may be unavoidable.
10. Try to strike a balance between fanciness (bells and whistles) and monotony. In the absence of structured technical support, “simple but effective” is a good motto to adopt.
11. After this initial experience, the author now has a viable way, namely online lectures, to cover classes when out of the office at research conferences.
12. Creating online lectures with narration forces the instructor to examine every word he/she speaks and how it might be interpreted. This will undoubtedly improve the instructor’s teaching ability with respect to all classes.
13. The techniques used to develop these online lectures are easily transferable to research, extension, and continuing education duties.

14. Within the online lectures, keep external references to entities that might change (Web addresses, text references, etc.) to a minimum. This will decrease the future workload when such entities indeed change. Such information can be provided on an associated course Web page where it is easier to monitor and/or modify.
15. Have at least two people review the online material. Be sure that at least one person is familiar with the material and the other is not. The former will assess content; the latter can provide insight into things never considered by the instructor. For example, he/she might see something in an image that seems confusing. Often, this issue is trivial to the instructor based on years of experience with the subject matter. However, if someone unfamiliar with the material notices this point of confusion, students probably will as well.

CONCERNS

Several issues of concern remain after the development and initial offering of the online forest measurements course in the University of Arkansas-Monticello School of Forest Resources. For example, institutional Web stability remains a concern. If the material is made available on a platform that is unstable, students, and the instructor, quickly become frustrated.

Every time a textbook is changed or updated, chances are various aspects of an online course will need to be changed. Granted, if external references are kept to a minimum within the lectures, this will not be too daunting of a task. However, some changes will have to be made, as it is virtually impossible to eliminate all external references.

If an institution goes through a curriculum revision, the subject matter assigned to a given class will most likely change. In such a scenario, will some of the work in creating the original online class be in vain? This is especially important if the course is developed just prior to a curriculum revision.

Whether intended or not, the instructor becomes the focal point of all technical support questions. In the absence of a structured technical support arena with experts available for consultation, frustration levels in students and the instructor quickly rise.

SUMMARY

The development and initial offering of an online forest measurements course at the University of Arkansas-Monticello School of Forest Resources taught many lessons and opened some new avenues with respect to offering courses. The tremendous frontloading of the workload (350 hours in this case) will hopefully be recouped as the online course is repeatedly offered over time.

Student evaluations of this initial online course were extremely positive and the author is confident the students learned the material. Experience in the online arena has most definitely been gained and is now transferable to other faculty in School of Forest Resources as well as others via this paper. It is hoped that thoughts and observations presented in this paper will assist other first-time online instructors as they develop and offer their courses.

ACKNOWLEDGMENTS

The author would like to acknowledge the University of Arkansas System Distance Learning Academy for providing the framework in which this work was created. Additionally, the photographic assistance of Mr. Raju Gadtoula and Ms. Michele Renschin is recognized. Finally, Dr. Hal Liechty's efforts with respect to online lecture review are hereby acknowledged. This manuscript is approved for publication by the Director, Arkansas Agricultural Experiment Station.

DISTANCE EDUCATION IN FIRE ECOLOGY

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ABSTRACT: Oregon State University is developing a new distance education course in Wildland Fire Ecology. Professors from the departments of Forest Management, Forest Science, Rangeland Resources, and Fisheries and Wildlife are involved, as well as guest lecturers from BLM, Forest Service, and USGS. Course delivery will be via videotape and Blackboard® Web pages. The six professors involved in designing the course initially were skeptical about the potential of distance education. However, they soon realized several advantages of this mode of education: being able to take students, via videotaped field trips, to many diverse biomes during any season of the year; bringing in a number of guest lecturers from different regions of the country; and developing case studies from different parts of the world. The instructors also realized some limitations, including the need to make text and graphics larger than usual so that they will be clear and legible on videotape. The course will initially be taught to a live class at Oregon State University during Winter quarter 2002. Students will be asked for constructive criticism of the video modules and Web pages. Feedback from this test group will be used to refine the course content for initial distance delivery in fall of 2002.

INTERNET-BASED FORESTRY EXTENSION: USING IT IN THE CLASSROOM

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ABSTRACT: The Internet Forestry Explorer is a Web site designed to present information about forest and watershed management. The target audience includes natural resource professionals, forest landowners, environmental education teachers, citizens of the featured forests and watersheds, and to a lesser extent anyone who is interested in learning more about their state's natural resources. Components of the Web site include an interactive GIS that allows the creation of tailored maps, virtual "walking tours" where users can view photos, pages of forest management examples, and links to organizations and other pages of interest. One component was created as part of a three-university virtual forest project. Penn State chose a private, award-winning tree farm to discuss and highlight forest sustainability according to the Montreal Protocol. This site includes pages describing the 7 criteria and 67 indicators of the Montreal Protocol, as well as a walking tour of the tree farm. A survey was conducted to analyze the effectiveness of the Internet Forestry Explorer in educating target audiences. This presentation will discuss the technical construction of the Web site, the results of the survey, and how the site may be used in university classroom setting.

EXPERIENTIAL LEARNING AT CALIFORNIA POLYTECHNIC STATE UNIVERSITY'S SWANTON PACIFIC RANCH

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ABSTRACT: Swanton Pacific Ranch (SPR) is a 3,200-acre fully operational ranch, including forested lands, located 12 miles north of Santa Cruz, California, and 200 miles north of the California Polytechnic State University, San Luis Obispo main campus. Even though the property is 200 miles from the main campus, it is used extensively for experiential learning activities. SPR was first established as a Mexican land grant in 1843. Since that time, it has had several owners and has been a dairy, and had several agricultural operations including growing crops, such as artichokes, brussels sprouts, and also cattle operations. The area was logged from 1905-1923 to rebuild San Francisco after the earthquake and fire in 1906. In the 1930s it was Boy Scout camp. Albert Smith began buying what is now Swanton Pacific Ranch in 1943. In 1986 he entered a cooperative lease agreement with Cal Poly for use by College of Agriculture students for “learn by doing” activities. In 1993, when Al Smith passed away, he left the Ranch to Cal Poly. His goal was “to see this place kept intact and natural, a lab and a classroom for the college of Agriculture for ‘learn by doing.’” For more information on the history of Swanton Pacific Ranch, please refer to their Web page (www.spranch.org). SPR is made up of approximately 125 acres of irrigated land, 1,900 acres of rangeland, and 500 acres of redwood and Douglas-fir forests.

The distance of 200 miles between Swanton Pacific Ranch and Cal Poly’s main campus does not preclude it from being used for experiential learning. The ranch is used for class field trips, internships, enterprise projects, research projects, and student clubs. SPR has bunkhouse style accommodations for 14 interns. There are also two 30-foot yurts that are used for class field trips. Ranch style houses are used as office space and for additional lodging.

Over twenty courses from the College of Agriculture and across campus use the property for class field trips. Several classes from the Natural Resources Management Resources use the ranch annually. These classes include forest harvesting and utilization, mensuration, silviculture, forest health, timber management and watershed. SPR is also used by classes from soil science, animal science, crop science, and English. The ranch also has distance learning facilities, which are used to transmit courses both from, and two the ranch.

Interns (24 annually) can be found at SPR year round from several different majors and emphasis areas across the campus. Interns participate in all aspects of ranch management and thus play an important part in the management of the ranch, and at the same time they experience the true “learn by doing” aspect that has always been a mission of Cal Poly. These internships are paid positions. Some of the hours worked are to pay for room and board on the ranch. The interns work in many different aspects of ranch management, including activities related to forestry, hydrology, animal care, animal science, watershed and hydrology, and general agriculture. All interns participate in several areas of ranch management and play a very important role in the management of the ranch.

SPR is also used by student organizations. For example, the Logging Sports Team has built a competition area in 1999. After completing the competition arena, they hosted the Association of Western Forestry Clubs logging conclave in which over 200 students competed. They have also hosted two California conclaves.

Enterprise projects in which student clubs or individual students can earn money also take place on the ranch. For example, the Stocker enterprise project involves 15-20 students annually. Students help to raise and care for the cattle and in the selling of the cattle.

At any given time, there are several students working on senior projects or working with faculty members of research projects. Research projects on the ranch currently include development of volume equations, growth and yield modeling, pine pitch canker research, water quality, and a paired watershed project.

As can be seen from the above-mentioned activities, SPR is an incredible resource for Cal Poly, and it is extensively used by faculty and students for experiential learning activities. Students enjoy the learning experiences they have at the ranch and do not mind having to travel over three hours for these experiences.

UNDERGRADUATE STUDENT INTERNSHIPS IN NATURAL RESOURCES AT VIRGINIA 4-H EDUCATIONAL CENTERS

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ABSTRACT: Virginia has six 4-H educational centers that provide residential camping experiences for over 22,000 youth per year, the second largest 4-H camping program in the United States. These children have many learning opportunities in the areas of natural resources and outdoor living skills. Beginning in 1995, the Chesapeake Bay Program in cooperation with the Virginia Division of Soil and Water Conservation provided funds for water quality instructors at each of the 4-H Centers. In 1998, the Virginia Forestry Educational Foundation began supporting a similar internship program for undergraduate students to serve as forestry instructors. Nearly 50 undergraduate students have now served as natural resource interns at the 4-H Centers. A description of the two internship programs, the process followed, and future directions are discussed.

INTRODUCTION

4-H is a youth development program administered through the land-grant universities in each state, and was originally developed as a way to rapidly introduce change into the economic life of citizens through youth education (Wessel and Wessel, 1982). It remains a powerful force as the nation's largest youth educational program (Meadows, 2002). In Virginia, the 4-H program is administered through Virginia State (the 1890 land-grant university) and Virginia Tech. Leadership for 4-H natural resources programs is provided by Extension Specialists on both campuses. Extension Agents in each city or county manage a comprehensive 4-H program that includes camping as one of three delivery modes for 4-H curriculum.

Virginia 4-H camping programs began in 1917, and the first 4-H Camp built specifically for 4-H'ers was in 1928 (Meadows and Garst, 2001). In the late 1950s, Virginia embarked on a plan to develop regional 4-H educational centers that could be used year-round and by groups other than 4-H (VCES, 1987). Today there are six 4-H educational centers serving more than 31,000 youths annually (Figure 1). The largest numbers of these youths attend junior 4-H camps held during the summer months for ages 9-13. Each year, every county and city in Virginia conducts a junior 4-H camp program at one of the 4-H educational centers.



Figure 1. Virginia 4-H Educational Centers

4-H Centers are staffed in the summer months by college-age (18-24) seasonal employees who seek career-related employment away from home. These paid employees teach morning classes, supervise afternoon recreation, and conduct evening programs and special events. Each week, county/city Extension Agents provide their own 4-H teen and adult volunteer staff who supervise campers at night and supplement the programs offered by summer staff. Every 4-H Center has a year-round Program Director who is responsible for hiring summer staff and coordinating camp planning with county/city Extension Agents.

4-H camp is an inexpensive experience designed to develop youths' life skills using exciting, hands-on, educational programs conducted in an outdoor setting. When children come to camp they have a wide variety of camp classes to choose from:

- Forestry
- Water Quality/Aquatic Education
- Paddling (canoeing, kayaking)
- Shooting Sports Education (archery, small bore rifle, shotgun)
- Computer Science
- Performing Arts
- Outdoor Adventure/Outdoor Living Skills
- Low Ropes/High Ropes/Climbing
- Swimming
- Animal Science (equine/small animals)

A 2001 survey of 9,000 youth campers ages 9-13 indicated that 4-H camp participation increased participants' life skills in the areas of developing social relationships with new friends and developing new skills (Garst and Bruce, 2001). Furthermore, parents/guardians indicated that Junior 4-H Camp participation made their child more likely to take care of his/her own things, share work responsibilities, and take initiative to complete tasks.

INTERNSHIP PROCESS

The internship program begins with discussions between the Program Directors at each 4-H Center and the campus-based Extension Specialists to determine if there is a need for a summer intern to teach natural resources. Almost without exception, 4-H Centers have requested an intern. After the need is determined, the Specialists solicit grant money for the position. Once grant money has been received, the search for interns begins on the Virginia Tech and Virginia State campuses in January. Interns are interviewed by the 4-H Center Program Directors and are generally hired by March 15. Camp sessions begin in mid-June and continue through late August. Typical pay is \$1,900. The 4-H Centers provide room and board, which represents roughly half of the cost of providing an intern (Figures 2 and 3).

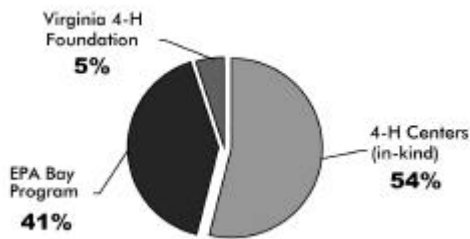


Figure 2. Funding Sources for the Water Quality Internship

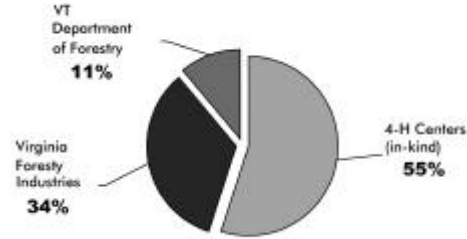


Figure 3. Funding Sources for the Forestry Internship Program

Interns receive 3-4 days of state-level intensive training in May, before the summer camping season begins. This training includes two days of specialized subject-matter training in forestry and water quality. The other days are spent learning how to work as a team to run a residential camp program. In addition, interns receive 5 days of on-site training just prior to the start of camp at their respective 4-H Centers. This training provides interns with the opportunity to prepare their program areas, develop lesson plans, and continue to develop a strong working relationship with other program staff. Training topics may include risk management, diversity, managing youth behavior, providing quality programs, song leading, and others.

During summer camp, interns are expected to teach morning/afternoon classes in water quality or forestry, supervise afternoon recreation, and lead evening programs. They do not work weekends. The process repeats itself with a different county/city camp group each week of the summer. Whenever possible, interns organize whole group activities that teach water quality and/or forestry to the entire camping group (in addition to the instruction provided to each morning/afternoon class). At the end of the summer, the intern program is evaluated through interviews and questionnaires.

UNDERGRADUATE INTERNSHIPS IN WATER QUALITY

The water quality internships began in 1995 when the Chesapeake Bay Program of the Environmental Protection Agency provided funding to hire undergraduate interns at each of the six 4-H Centers. Under the direction of the Extension Specialist at Virginia State, a curriculum was developed that teaches the major sources and types of point and nonpoint source water pollution, Best Management Practices, water quality monitoring methods, and stream/lake structure and processes. Interns supplement this information with activities from Project WET and Aquatic WILD, two nationally recognized environmental education curricula. During their week at camp, youngsters collect and observe collect fish and aquatic macro-invertebrates, conduct chemical tests (pH, dissolved oxygen, etc.), explore stream/river/lake watersheds, and learn the many processes and issues concerning watershed function and protection. Evaluations show an average 89 percent approval rating. Pre/posttesting indicates an average increase in knowledge and understanding of water resource processes and issues ranging from 40-72 percent.

UNDERGRADUATE INTERNSHIPS IN FORESTRY

The forestry internship began in 1998 with one donation from a forest products company with an interest a nearby 4-H Center. The Extension Specialist at Virginia Tech developed a curriculum that teaches the ten most economically important trees of Virginia, the forest products that are made from trees in Virginia, and the tools that foresters use to protect the health of trees and forests. Within two years the Extension Specialist was able to obtain additional funding to support five interns, the number requested by 4-H Center Program Directors.

One of the unique goals of the forestry instructor position is to encourage undergraduates to explore a career in Extension as a way to increase the number of agents trained in natural resources. All recruitment for forestry

interns is done within the VT College of Natural Resources, as are the initial round of job interviews. Forestry interns are also interviewed on campus at the end of the summer. Results show that interns unanimously agree their experience was meaningful and that their forestry training was adequate. On a scale of 4.0 (highest) they rate their interest in an environmental education career as 3.2, and their interest in an Extension career as 2.6.

BENEFITS TO UNDERGRADUATE STUDENTS

Undergraduates benefit from the internship experience. They receive career-related work experience. Many are working away from home for the first time, learning how to live and work independently. They meet a wide variety of Extension employees and are exposed to Extension strengths, such as community and volunteer development. They must work together as a team, both as a summer staff and in collaboration with city/county volunteers who arrive each week with each new camping group. The forestry interns have frequent contact on campus with the Extension Specialist. Finally, each intern receives training and practical experience in environmental education.

FUTURE DIRECTIONS

Classes taught by interns reach a small subset of the total 4-H camper population. Whole-group activities, such as leaf relays, quiz bowls, and campfire programs, can be designed to teach important concepts related to natural resources. In the future, these activities will be encouraged in order to increase the number of youths reached. In addition, 4-H project guides that can be started at camp and taken home for completion are being developed. Financial resources are always a challenge. Since the forestry program is underfunded compared with the water quality program, more industry support will be sought, with the goal of having at least one industry connected financially and personnel-wise with each center. The water quality program would like to have ground and surface water (enviroscape) models to help 4-H campers visualize non-point source water pollution. Finally, more on-campus follow-up and volunteer opportunities with interns is desired to increase undergraduate career development in the area of natural resources education.

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INFUSING EXPERIENTIAL LEARNING INTO A WILDLIFE CURRICULUM: TWO MODELS FOR ONE COURSE

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ABSTRACT: Experiential learning refers to contextually relevant knowledge acquired through problem solving, critical reflection and discussion, and decision making. It is not a new concept to academe; however, ways to incorporate experiential learning into our curriculum have been challenging as class size increases and student contact hours decrease. For wildlife students, learning experientially is an unwritten job requisite. Increasingly, students are exiting learning environments with little to no contact outside of formal lecture experiences. In this paper, we suggest ways to incorporate experiential learning into an undergraduate curriculum. Specifically, we focus on experiential learning in the wildlife curriculum with particular emphasis on the “Wildlife Techniques” course. This course is centered on teaching the practical application and limitations of various field, analytical, and management techniques. Consequently, this course is a perfect candidate to be taught using experiential learning techniques. We present two models for teaching this course that incorporates experiential learning throughout the duration of each program. One course is a two-week intensive program with little formal lecture periods, while the other is a semester-long course with a one-week intensive session at the beginning and more formal lecture, discussions, and case-study activities throughout the remainder of the semester. The pros and cons and lessons learned while teaching under these respective structures will be presented.

THE KEYSTONE PROJECT: TRAINING WATERSHED PROFESSIONALS THROUGH EXPERIENTIAL LEARNING

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The Center for Watershed Stewardship has developed a curriculum that supports graduate-level water resource education, promoting team-oriented, interdisciplinary problem solving. The purpose of the Watershed Stewardship Option is to educate a new type of professional able to work in an interdisciplinary fashion in a team setting to craft creative solutions to complex water resource issues. We educate professionals who can integrate science with design, and planning with management. Most importantly, each student gains “real-world” practical experience in the context of local, community-directed watershed planning and management. This hands-on learning takes place through a two-semester “Keystone Project” conducted in partnership with nonprofit organizations, government at multiple levels, and economic and business interests. Graduate students work with the community to identify and evaluate problems in their watershed. Public presentations by the students outline problems and solutions, which are then presented in an extensive report. This curriculum is unique among graduate water resources programs in its interdisciplinary approach to experiential case problem solving. We will present the challenges and opportunities that have arisen from this experiential curriculum and describe the benefits gained by the students as a result of their significant investment of time and energy above and beyond the typical graduate degree.

RECAPTURING THE WONDER IN NATURAL RESOURCES: PERSPECTIVES FROM A COMMUNITY OF LIFELONG LEARNERS

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ABSTRACT: This session follows up the paper presented in Session FP1 and will be an open session where we can engage in conversation(s) with others about fostering learning journeys that encourage learner engagement with the wonder of the environment and natural resources. Those discussions will occur in small groups based on participants' stated interests from the publicly available space. (See page 7)

CURRICULAR THREADS: INTEGRATED THEMES FROM INTRODUCTORY TO CAPSTONE COURSES

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ABSTRACT: Effective curricular design in natural resources should concentrate not only on critical technical content, but also on developing important themes in ever-increasing complexity as students proceed from introductory to capstone courses. We propose a set of perspectives/values (e.g., citizenship, respect, curiosity, lifelong learning, and the role of science in society) and critical skills (e.g., communication, leadership, critical thinking, problem solving, and team working) that we believe should be used as a set of "curricular threads" uniting individual courses in the curriculum. Students should be exposed to these perspectives early in their student careers, and they should be challenged to identify and continually refine their own set of professional and environmental perspectives and values throughout their academic career. Development of those perspectives could be interwoven with fostering critical-skills development that will increase students' professional effectiveness.

INTRODUCTION

Instructors will often comment woefully that students are not prepared for material they are covering in their classes. We would argue that, much like biotic succession, where a barren field when left alone will gradually revert to a forest with several seral stages along the way, our students don't come to us as late successional forests, and it is our job to develop to cultivate them through the seral stages. Furthermore, not all students are at the same levels of succession at the same time in their academic careers. When students are faced with assignments and expectations that may be more advanced than they are prepared for, instructors often experience a classroom "revolt," where students become frustrated, and the teachable moments are nonexistent because of resentment held by the students. In this case, we really can't blame them. We don't expect graduate students to

first defend their thesis and then write it, nor do we expect them to first write their thesis before building a justification and developing the relevancy of their work. A student who writes poorly as a freshman will continue to write poorly if not properly guided early in his or her academic career. Therefore, we propose that an effective curriculum guides students by building on themes from simple to complex through the academic career of the student.

In the book *Courage to Teach*, Palmer (1998) states, "Good teachers possess a capacity for connectedness. They are able to weave a complex web of connections among themselves, their subjects, and their students so that students can learn to weave a world for themselves." While Palmer was referring to the individual teacher's capacity to teach, imagine if this paradigm were transferred to a group of teachers organized as an academic program. The result could be a very powerful program of instruction for students within a curriculum. Yet, many of us teach our courses in a vacuum. Professor X has been teaching his class for 25 years without changing it, yet few people in Professor X's department know the learning objectives for the class. If faculty are unaware of material taught in their own department, then they are certainly clueless with regard to what is taught in other departments.

In the current academic model of higher education, students take a suite of classes that ideally build upon one another; for example, Chemistry II must be taken after Chemistry I. Classes are generally billed as freshman, sophomore, junior, or senior level and content is then supposedly "level specific." However, students will often perceive the matrix of classes (that faculty so carefully choose to produce a balanced curriculum) as a jumble of hoops merely to be jumped through. Relevant material is not automatically transferred between classes in the minds of our students. In many cases teaching practices that employ rote learning, topical surveys, emphasis on factoids, and isolated opportunities to apply learned material actually act as impediments to the transfer of information between classes (Ormrod, 1999).

CONCEPT OF CURRICULAR THREADS

In the K-12 education system in Virginia, teachers are required to base their material on prescribed "Standards of Learning" (Board of Education 1995, 2001). For each broad subject (math, science, social studies, etc.) there are specific "strands" that must be incorporated into classroom learning. For example, within the subject of math, there are six strands: number sense, computation, measurement, geometry, statistics, and patterns/algebra. Starting at the kindergarten level, the statistics strand identifies specific objectives for the student: count and tally objects, use picture graphs, read counter dials. The strand then continues through seventh grade, building in complexity along the way. For example, a fourth-grader must be able to determine simple probability and collect and display data using line and bar graphs. By seventh grade, pupils must design an experiment, determine and express probability, calculate mean, median, range, and mode, display data with graphs, interpret data and predict results. While most university faculty would likely balk at a state-mandated, strict structure for higher education, the approach may be a highly valuable tool for maximizing student learning and outcomes within specific academic programs such as forestry, fisheries, or wildlife.

EXAMPLES OF CURRICULAR THREADS

We propose that effective curricular design is a combination of classes structured around threads within major thematic areas that we have identified as critical theoretical and technical content, critical skills, and values/perspectives (Table 1). Critical theoretical and technical content gives students a solid technical grounding in the things they need to know. Important technical threads within the themes include species identification, basic statistical concepts, life history and ecology, genetics, and approaches to managing fish and wildlife populations. Critical skills are the second major theme that includes threads of specific technical skills and broader skills (such as communication) that graduates will be required to know to do their jobs effectively. Critical skills threads include problem solving, critical thinking, team working, organizational skills, and technical field skills for sampling fish and wildlife populations. Finally, the third theme, values and perspectives, is one that is not

taught but rather nurtured or developed as these tend to be individual specific, based on the student's background and experiences. Included in this thread are notions of citizenship, respect, curiosity, a commitment to lifelong learning, and cultural sensitivity.

Table 1. Examples of threads within each of three major themes as identified by participants in the facilitated discussion at the Fourth Biennial Conference on University Education in Natural Resources, Raleigh, North Carolina, 2002.

Critical Theoretical and Technical Content

- species identification
- basic statistics
- life history and ecology
- genetics
- management approaches
- spatial information systems
- scale
- information technologies
- quantitative and qualitative analyses
- human dimensions
- policy and institutions
- economics

Critical Skills

- communication (written, oral, visual, interpersonal)
- critical thinking
- problem solving
- team working
- organizational
- negotiation and conflict resolution
- administrative/project management
- leadership
- diplomacy
- self-evaluation
- field skills

Values and Perspectives

- citizenship
 - respect
 - curiosity
 - lifelong learning
 - cultural sensitivity
 - ethics
 - flexibility
 - philosophies
 - international perspectives
 - passion for resources
-

APPROACHES FOR IMPLEMENTING CURRICULAR THREADS

In many cases, individual faculty may already incorporate the critical threads within their courses, but a faculty group exercise is important to elucidate and strengthen the in-curricular connections. If faculty are aware of the building blocks in other classes, they can confidently refer students to material learned in prior classes.

One example of a critical thread in our curriculum is the communication (writing) thread. In our freshman class required for all college majors (“Introduction to Renewable Natural Resources”) students are required to write several microthemes. A microtheme is a short (less than 250 words), structured (introduction, body, conclusion) paper that helps students develop concise, scientific writing skills appropriate for natural resources. Within the microtheme exercise, we explain the concept of conveying a strong and complete message in few words while posing a reasoned argument for an opinion on an assigned topic. Students submit drafts before the final paper is submitted (we start the first microtheme with a draft outline) and we find that their writing markedly improves through the semester. To follow up on microthemes, the sophomore class (“Principles of Fisheries and Wildlife Management”) includes an assignment that requires students to use the microtheme approach to write letters on topics that we cover in class. One example is a letter to the university president in which the student proposes to use a popular piece of property on campus for restoration of an endangered species (their choice of species). Students must justify why the species is important and how the property must be altered to address all of the life history needs required by the species. Again, the assignment is short (less than two pages) and they are to focus on presenting their ideas in a concise, but compelling format. As juniors, the students experience hands-on investigations through the fisheries techniques class and develop concise written presentations of scientific information. Finally, as seniors, students write a management plan based on their own field investigations to collect data and their subsequent analysis of that information. Seniors must fully synthesize their information for this document and employ the writing principles that they learned in earlier classes. We propose to further develop the curricular thread concept in our program by actively *reminding* students of the principles that they have learned previously. Imagine the frustration that would occur if we gave the senior assignment to students in the freshmen or sophomore years before they had the skills and experience to thoroughly engage in this experience. Similar thread examples exist for the critical theoretical and technical content (population assessment), and values/perspectives (Table 2).

Table 2. Examples of curricular threads for critical theoretical and technical content and values/perspectives in Natural Resources education.

Level	Example 1: Theoretical and Technical Content (Population Assessment)	Example 2: Values/Perspectives (citizenship)
Freshmen	conduct survey of birds in area with point-transect methods	participate in or organize streamside cleanup
Sophomore	conduct mark-recapture using student population in large class	conduct biomonitoring of local stream
Juniors	actually mark animals/fish and attempt to recapture	participate in project Wet/assist with fish dissections at local middle school
Seniors	prescribe and use best assessment approach for real project	develop pond management plan for veteran’s hospital

During the facilitated discussion at the Fourth Biennial Conference on University Education in Natural Re-

sources in Raleigh, North Carolina, 27 participants were divided into small groups to develop an example of level-specific activities that would support one of the listed curricular threads. The groups volunteered two separate examples (Table 3). Both groups (as well as the authors) noted a difficulty in developing the programs. It was easy to identify the starting point of a thread with a freshman-level activity. But then the groups had more trouble defining sophomore and junior roles and jumped ahead to define the senior task for the thread and then worked backward. So, it seems that those of us participating in this exercise can very quickly define the beginning and endpoints for our students, but the roles that sophomore and junior levels play in academic development are less clear. An additional point is that each of the activities outlined with the curricular threads (Table 3) is just an individual activity and will be viewed by the students as such, unless the faculty use an active approach to help the students recall important principles or building blocks that they learned in earlier exercises.

Table 3. Examples of activities to support development of a curricular thread throughout an academic program developed by participants in the facilitated discussion at the Fourth Biennial Conference on University Education in Natural Resources, Raleigh, North Carolina, 2002.

Level	Example 1: Critical Skill (teamwork)	Example 2: Critical Skill (public communication)
Freshmen	Camping weekend with assigned roles for food, tents, firewood (etc.)	Attend local public hearing and write reflection paper on observations of communication styles.
Sophomore	Some sort of laboratory exercise.	Write a scientific article for a newspaper.
Juniors	Write an endangered species plan with a working group or team.	Prepare formal testimony on a topic.
Seniors	Interdisciplinary management plan for a real area or client.	Set up a campus public hearing on a controversial issue.

CHALLENGES IN DEVELOPING CURRICULUM THREADS

During the facilitated discussion we also heard several concerns relating to the issues of transfer students, full faculty participation in thread development, and the possibility that this approach may overburden faculty teaching introductory courses. Although the last item was a concern over the number of threads that would be implemented by the introductory class, we really are proposing repackaging existing courses, not additions to the curriculum. Students transferring into the curriculum could be required to take the classes on which the threads are based. In the Natural Resources curricula at Virginia Tech, an incoming transfer student would be required to take two classes that would develop the foundation for their final two years at Virginia Tech. If a student comes well prepared with the basic courses, this requirement does not usually overburden their schedules. Finally, faculty cooperation and collaboration may be the greatest challenge if faculty are polarized into academic “domains.” However, unlike most contentious discussions that involve curriculum changes (addition or deletion of classes), this approach may involve only a subtle tweaking of material already present in the curriculum or the addition of a few key pieces to tie the threads together between class levels.

DESIRED OUTCOMES FROM CURRICULAR THREADS AND ADVANTAGES TO THIS APPROACH

The most obvious desired outcome from this approach would be that our students would learn more from a cohesive format, and this would result in a retention of more of this information. One of the participants in the facilitated discussion pointed out that this could be a real mechanism for retention. If students are shown the linkages

of the material between their courses and the relevancy of the material to the real world, they may view their learning as they progress in their academic career as an investment.

From the instructor's perspective, the "threads" approach provides benefits in that we create a connection to other teaching faculty, and we can encourage transference of learned material between levels when we are confident of the materials covered in another class. Furthermore, validation that the threads are important evolves from faculty workgroups that identify important themes. Without this collaboration, students only see common themes where faculty thinking intersects by accident rather than by design. This is not to suggest that Faculty Member A know all of the material, exercises, etc. in Faculty Member C's class. But, this does mean that the faculty work together to identify key threads and appropriate measures of the success of the threads. We believe that one of the best examples that faculty can create for students in our academic programs is to demonstrate our abilities as lifelong learners who are working in a cooperative team capacity to create learning experiences that are in the best interests of our students.

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SUSTAINABLE FOREST MANAGEMENT GRADUATE EDUCATION

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ABSTRACT: During the past year, members of the Sustainable Forestry Partnership, in cooperation with other forestry schools, with funding from the several private foundations and USDA, have been exploring approaches for enhancing graduate education programs to foster adoption of Sustainable Forest Management curriculum

concepts. Ten National Association of Professional Forestry Schools and Colleges (NAPFSC) members have conducted two focus groups to gain understanding of curriculum opportunities and challenges. The findings from these focus groups will be reported out at a national conference in Kansas City in November 2001. That assembled group will begin to discuss ways and approaches for cooperating across institutions to share resources to engage expanded opportunities for enhancing education on sustainable forestry. We will quickly present the findings from the Kansas City workshop, and then explore how we can further the discussion, foster partnerships, and consider how we can develop and implement new reaching strategies.

INTRODUCTION TO THE SUSTAINABLE FORESTRY VIRTUAL TOUR

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ABSTRACT: The Sustainable Forestry Partnership (SFP) began in 1995 as a diverse group of faculty from Oregon State University. With initial support from the John D. and Catherine T. MacArthur Foundation, and later other foundations and governmental support, SFP grew to include faculty and staff at Auburn University School of Forestry & Wildlife Sciences, Oregon State University College of Forestry, the Pennsylvania State University School of Forest Resources and the United States Department of Agriculture Cooperative State Research, Education, and Extension Service (USDA CSREES). SFP has demonstration of sustainable forestry practices as one of its five principal programmatic foci. Working toward this effort, in January 2001 the Forestry Media Center at Oregon State University initiated development on a World-Wide-Web-based "sustainable forestry virtual tour." When complete, the Web site will link sustainable forestry tours in Oregon, Alabama, and Pennsylvania. Currently, the Sustainable Forestry Virtual Tour prototype represents only Oregon; it is the prototype "virtual demonstration." We used the latest in Web site technology to develop the "virtual" electronic tour of a western Oregon forest. With the addition of video clips, panoramic photos, and interactive images, we attempted to bring the forest to the computer user. Our Web site content focuses on local forest management while applying the Montreal Process Criteria and Indicators for sustainable forestry in temperate forests. This presentation will briefly explore the Web site content and structure; it will be the foundation for a follow-up discussion entitled, "Comparing the Effectiveness of Virtual and Traditional Forestry Field Tours."

COMPARING THE EFFECTIVENESS OF VIRTUAL AND TRADITIONAL FORESTRY FIELD TOURS

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ABSTRACT: Virtual tours are among the many new Internet-based tools with potential applications in natural resource education. While technology exists to create virtual tour Web sites, little is understood about how they meet educational objectives and whether they can be complementary alternatives for traditional field tours. The Sustainable Forestry Partnership and the Forestry Media Center at Oregon State University created parallel

virtual and field tours to compare these teaching techniques. Both tours illustrate the Montreal Process Criteria and Indicators for sustainable forestry and were offered to local members of the Society of American Foresters, family forestland owners, and OSU faculty, staff, and students. Pretour and posttour assessment forms were used to compare the effectiveness of each tour. The results of the evaluation have implications for utilizing virtual tours in university-level natural resource education.

INTRODUCTION

Long-term sustainability of forests is often a topic of discussion in the forestry profession. Members of the Sustainable Forestry Partnership (SFP) at Oregon State University (OSU) identified a need among foresters for a continuing education program about sustainable forestry. They used the OSU McDonald-Dunn Research Forest near Corvallis, Oregon, as the tour setting.

SFP members selected a virtual tour as the mode of instruction for this continuing educational program. Virtual tour Web sites use audio and video technology, text, and graphics to allow viewers to explore remote locations from their home computers. The Internet delivery allows large number of geographically dispersed foresters to update their knowledge about sustainable forestry at their own convenience. The SFP worked with a Web page designer in the Forestry Media Center at OSU to create a virtual tour.

After the virtual tour was complete, the SFP created a field tour that was as similar as possible to the virtual tour. This evaluation compared the two tours based on three specific objectives: (1) to determine how well the virtual and field tours met the established educational objectives; (2) to measure the level of acceptability of the tours; and (3) to explore unanticipated outcomes of the tours. It provided the Sustainable Forestry Partnership, Society of American Foresters, and other natural resource educational organizations with baseline data about how a virtual tour performed as an educational program. The evaluation also identified relative advantages and disadvantages of virtual tours and discussed implications for using virtual tours as continuing forestry educational programs.

We created a logic model diagram, shown in Figures 1 and 2, to describe specific elements of, and provide consistency between, the virtual and field tours (University of Wisconsin, 2001). After creating logic model diagrams for the virtual and field tours, we selected evaluation methods that would provide evaluation stakeholders with a realistic measure of the educational program.

SUSTAINABLE FORESTRY VIRTUAL AND FIELD TOURS LOGIC MODEL

ASSUMPTIONS:	INPUTS:	OUTPUTS:
Learners will be highly motivated, voluntary	OSU Faculty	Virtual tour
Topic will be timely, relevant for the learners	OSU Staff	Field tour
Learners will naturally prefer one of the two types of tours	SAF	
	GRA	To reach:
	Grant money	Professional foresters
	Sustainable Forestry Resources	Forestry students
	Digital Camera	Local family forestland owners
	Software	

Figure 1. Assumptions, Inputs, and Outputs from the Logic Model for the Virtual and Field Tours

**SUSTAINABLE FORESTRY VIRTUAL AND FIELD TOURS
LOGIC MODEL (CONTINUED)**

OUTCOMES**Short-term:**

(1) Participants will understand the principles of sustainable forestry. They will be able to:

- Define sustainable forestry
- Discuss the 3 elements
- Contrast it with non-sustainable forestry

(2) Participants will understand how the Montreal Criteria and Indicators describe sustainable forestry. They will be able to:

- Describe indicators for the 7 Montreal Criteria
- Identify forest types to which the Montreal Criteria apply
- Describe how the OSU Research Forest met 1 of the 7 Montreal Criteria

Medium-term:

Participants will be able to:

- Apply the concepts of sustainable forestry to specific situations
- Write management plans and discuss the sustainability of them

Long-term:

Participants will be able to:

- Identify issues in their community that relate to sustainable forestry
- Describe relationship between sustainability and forest certification

Environmental Factors:

Field tours have been a long-standing tradition in forestry

Local foresters are familiar with the OSU McDonald-Dunn Research Forest

A learner's PC hardware and Internet connection speed will influence viewing

Sustainability is a broad topic, tough to quantify and qualify

The sustainability of several current forest management practices is debatable

There are two similar tours at Penn State and Auburn

Figure 2. Outcomes and Environmental Factors from the Logic Model for the Tours

EVALUATION DESIGN

Short-term intended and unintended learning outcomes were the focus of the evaluation. It was goal-based, so it measured the actual performance of the educational tours against the short-term outcomes from the logic model diagram. We defined an effective forestry tour as one that meets educational objectives while also being an enjoyable experience for participants. Additionally, our evaluation was comparative in that it compared the performance of the virtual tour to that of the field tour. There was not a control group for the comparison as it was not realistically feasible.

Participants represented a continuing forestry education audience and included members of several local chapters of the SAF, local family forestland owners, and OSU students, faculty and staff. Before the tour, participants filled out assessment forms that consisted of demographic and pretest questions. Immediately following the tour, participants completed posttour assessment forms that consisted of posttest questions and additional questions to record information about what they learned and to measure their opinions about the tour experience.

To assess learning that occurred as a result of the tours, we designed a series of six multiple-choice questions about tour content. They appeared as a pretest on the pretour assessment form and as a posttest on the posttour assessment form. The test questions were specific to the new information presented in the tour since many of the participants were professional foresters with high levels of knowledge about forestry.

Participants also rated statements using a Likert scale of 1-5 to assess the tour experiences. Several of the aspects did not depend on the method of tour delivery. These included tour location, ability to access additional information, amount of interaction with other people, amount of distractions, and amount and quality of information presented. Other evaluative statements addressed how well participants could see, hear and understand what was being presented, how much they learned from the tour, and how much they enjoyed it.

Virtual tour participants rated additional statements that were specific to a virtual tour such as how well they could navigate the Web page, how much they enjoyed the tour being self-guided, and how much they missed asking questions of the tour guides. They also rated the usefulness of the video and audio clips, the text, and the technology. The virtual tour evaluation open-ended questions regarded potential advantages and disadvantages of virtual tours.

DATA ANALYSIS

Frequencies were calculated for all response categories, translated into percentages of total responses, and graphed using histograms. Further analysis depended on patterns that appeared in the histograms and the research question being addressed. To analyze the data from the multiple-choice pretest and posttest questions, we compared gain scores for each set of tests. Experience ratings were divided into two groups using a natural break in the responses. We used nonparametric tests a significance level of $p=0.001$ for all statistical analysis since sample sizes were small. To analyze responses to the open-ended questions and observational notes we used the pattern matching technique (Yin, 1994).

SUMMARY OF RESULTS

A total of 14 people participated in the virtual tour and 22 participated in the field tour. Seven participants volunteered to participate in both tours providing us with additional comparative feedback. Those who viewed both tours completed one pretour assessment and a posttour assessment for each tour.

Results from the pretests and posttests are based on responses from 14 virtual tour participants (seven who only took the virtual tour and seven who took both tours, but took the virtual tour first) and the 15 field tour participants who only viewed the field tour. Pre- and postfield tour assessments from the remaining seven field tour participants, who viewed both tours, were not included in the analysis because they were exposed to the tour information twice. While participants did not achieve all five of the learning outcomes, results of the statistical comparison indicate that an equivalent amount of learning occurred as a result of both tours. Gain scores were distributed across a range that included some decrease, scores that remained constant, and a slight increase.

The next portion of the evaluation gathered participants' ratings for several aspects of the tour experience. Results were based on 14 virtual tour and 21 field tour participants. The majority of the aspects of both tours received favorable ratings of 4 or 5. When overall experience ratings from the virtual and field tours were compared statistically, there was not a significant difference. Participants found equivalent enjoyment from both experiences. Virtual tour participants identified several advantages and disadvantages of virtual tours. Many of the responses to these questions supported advantages and disadvantages identified in previous research.

CONCLUSIONS

From the learning assessment, we concluded that a virtual tour can be a complementary alternative to a forestry field tour as an educational experience. Participants' ratings of several aspects of the virtual and field tour ex-

periences were also equivalent, strengthening our conclusion. While our sample size was small and the scope of the evaluation was limited, we arrived at comparable results to those of similar evaluations. Virtual tours look to be promising additions for continuing natural resource education programs. If constructed well, virtual tours can be effective educational experiences and offer a unique complement to forestry field tours.

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TEACHING FOREST ECONOMICS AS A DISTANCE LEARNING COURSE

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In Spring 2000, a senior/graduate-level forest economic course was taught as a distance learning course with four students on campus and four other students at two distance learning sites. This paper will discuss the experience learned from teaching the course and reflect on the advantages and disadvantages of using the compressed video technology in the distance delivery.

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 reproduction methods with an emphasis on 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.

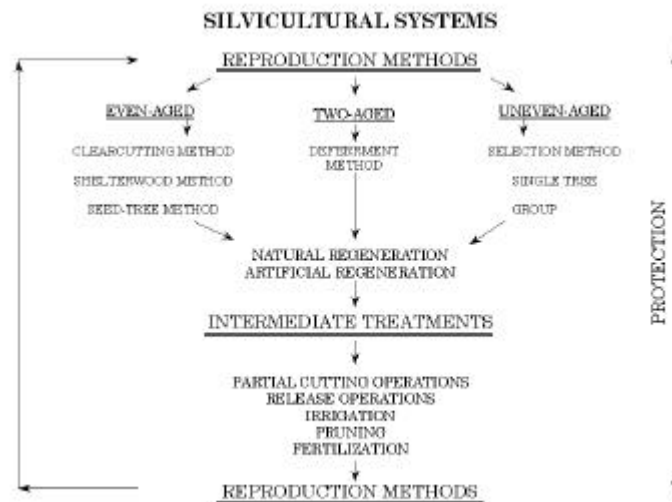


Figure 1. A Flowchart for Teaching Silviculture

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 bottomland 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 instruction 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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DEVELOPING A FIELD EXPERIENCE FOR NATURAL RESOURCE MAJORS

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ABSTRACT: Conversion from quarters to semesters allowed us to reinvent the field experience for College of Natural Resource majors. The new field experience strives to teach students the fundamental measurement skills needed for a summer job and to provide field experience and opportunities for teamwork. “Camp” operates for four weeks following spring semester, allowing students time to obtain summer jobs with university, state, and federal employers, which capitalize on students’ newly acquired field skills. The modular curriculum focuses on breadth of skills and uses technology to integrate them. Topics include map and compass, GPS, GIS, soil science, wildlife measurements, basic ecology, disturbance ecology, stream and watershed measurements, social and biophysical recreation measurements, plant identification and forest inventory methods. Students maintain journals and document their experiences using digital photography. Students spend the last four days in a self-guided resource data collection exercise that ranges from traditional timber surveys to stream assessments to recreational user surveys. Students analyze their data, and present their results to peers and CNR faculty in a PowerPoint presentation complete with ArcView maps and digital images of their study area.

ECOSYSTEM PRESCRIPTION PREPARATION: A ROCKY MOUNTAIN HIGH!

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ABSTRACT: Forest Resources Management majors, during their junior year in the professional forestry curriculum at the University of Tennessee, participate in a field camp, Forestry Spring Block, for the entirety of the spring semester. Courses range from woodland surveying through silviculture and forest measurements. The final course, a capstone course, involves the development of an ecosystem prescription on a designated woodland. During the spring field camps, 2000 and 2001, the students were invited to the Manitou Experimental Forest (USDA Forest Service) north of Woodland Park, Colorado, to develop their ecosystem prescriptions. Four scenarios were used: pre-Columbian restoration of uneven-aged ponderosa pine; emphases on wildlife management or wildfire protection in a wildland/urban interface; wilderness recreation; and timber management in uneven-aged ponderosa pine. Students gathered data, completed analyses, used FVS and SUPPOSE models to project stand development, and drafted their prescription. On the last day each crew made a PowerPoint presentation to the audience for review and discussion. The presentation will relate some of the teaching and learning experiences of the students and the faculty.

INTEGRATED RESOURCE MANAGEMENT COURSES: LESSONS LEARNED AFTER SIX YEARS

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ABSTRACT: Integrated management courses, or capstone courses, have been inserted into many forestry and natural resource college curricula. The general intent is to have the students bring together the knowledge they have gained in other courses and synthesize an holistic solution to some set of issues. At Syracuse such a course was made a required part of the senior year in the Forest Resources Management program starting in the fall of 1996. The author has taught the course almost every semester, sometimes in conjunction with others. Over the years various procedures were tried, different cases utilized, and different requirements placed on students. This is still a work in progress. However, many important lessons have been learned. These will be covered along with student reactions to different kinds of cases and procedures.

INTRODUCTION

At Syracuse, we instituted a major change in our undergraduate curriculum in the late 1990s. As part of that change we instituted a senior required course designed to integrate all subject matter. We refrained from calling it a “capstone” course, yet it is similar to most capstone courses. Since its inception in the fall of 1997, I have been the principal instructor in the course, save for one semester when I was on sabbatical in the fall of 1999. The course has been very interesting to teach. However, it has been a “work-in-progress.” That is, I have learned many things for each semester and revised the course slightly to incorporate these things. Recently we have also

used this course to assess our overall Forest Resources Management program. In this paper I will briefly cover the course objectives and procedures, give the chronology of the cases used, and describe in detail the lessons learned. As a final note I will cover what we learned from a one-semester use of this as an assessment tool.

COURSE OBJECTIVES AND PROCEDURES

Objectives

Course objectives are divided into concepts and skills. The concepts that the course aims to instill in students are (1) to see the forest as a unified biophysical and socioeconomic system; (2) to develop forest treatments for maintaining or altering desired conditions at the stand, forest, and landscape level; (3) to recognize the role of social, legal, political, and economic factors and values that influence choices in forestry; (4) working with a client and providing service to a community. Skills that course aims to sharpen are (1) the ability to use various problem-analysis and decision-making techniques in resource planning; (2) working with other professionals in a team situation; (3) presenting technical material to a client in a form that can be understood by the client.

Procedures

The course uses a case approach. Students work in teams on preparing management guidelines, recommendations, or a management plan for the client. The course integrates students' knowledge gained in other courses and through other educational experiences. In addition, each particular case has its own special circumstances. As such, detailed procedures are developed by each team each semester. However, the following are done each semester:

1. Each team makes an initial visit to the property with the instructor. This trip is either on an afternoon or Saturday. College transportation is provided for this initial visit.
2. A written work plan for the case is developed by the team and presented to the class early in the semester. This work plan includes what will be achieved during the semester, how any data will be obtained, and a tentative timetable for completing the work.
3. Each team makes a brief presentation to the class on their case around mid-semester. This presentation includes a brief description of the case setting, owner's objectives, work to be accomplished, and progress to date. This oral presentation is accompanied by a written progress report.
4. Each team is encouraged to meet with the instructor or the graduate teaching assistant at least every other week. The assigned class time can be used for such meeting or other time by appointment.
5. Each person in the course is to attend at least one presentation by someone outside of the course. The purpose of this is to see how others present material and to learn from others' strengths and weaknesses. Students are to turn in a brief (one paragraph) on the presentation attended and lessons learned.
6. Each team makes a presentation of their work at the end of the semester to the client. This is preceded by a "dry-run" of the presentation made to the entire class.
7. A typed written report is prepared by each team. A draft is turned in during the last part of the course. This draft is critiqued by the instructor and returned for use in preparation of the final report. Details of each report are determined by each case. However each report should contain the following:

- Project objectives
- Case setting, property description
- Owner's objectives

Methodology used to collect information and prepare plan
 Management alternatives considered (must have at least one realistic alternative in addition to the preferred, or final, one)
 Evaluation of alternatives
 Recommendations

8. This is a “service-learning” course. As such, it combines service to the greater community with student learning in a way that enhances the student academic experience while simultaneously improving the community. The service is integrated into this course’s syllabus, and it facilitates the “hands-on” component of the material you will learn in the classroom. A final assignment of this course is for each team to prepare a synthesis paper that focuses on the team’s contributions to the community, individual personal growth, and what the team learned in service relative to course content.

CHRONOLOGY OF CASES

The course was instituted as a full requirement in the Fall semester of 1997 and has been taught each semester (fall and spring) since then. Cases have been selected based partly on conditions known to the instructor and partly from requests from landowners and other stakeholders desiring management advice for properties. The following are the cases worked on and approximate enrollment each semester:

- Fall 1997: College forest, hypothetical division of 3,000 acres into 4 parcels; 60 students
- Spring 1998: McLean Game Preserve, Connecticut, 3,600 acres; 20 students
- Fall 1998: State Forest in New York, 6,000 acres; 60 students
- Spring 1999: Vegetation Plan for Syracuse City Zoo; 20 students
- Fall 1999: State Forest in New York, 6,000 acres; 30 students
- Spring 2000: Urban forestry plan for City of Syracuse; 20 students
- Fall 2000: Town of Webb forest in Adirondacks, 7,000 acres; 30 students
- Spring 2001: Two non-industrial forest properties (5 acres, 35 acres), Town park plan, recreation on State Forest in New York; 16 students
- Fall 2001: Sterling Nature Center and surrounding lands, 2,800 acres; 30 students
- Spring 2002: Oneida nation lands (700 acres), Cazenovia Link Trail (20 acres plus 1 mile); 11 students

LESSONS LEARNED

As stated in the introduction, this has been a “work-in-progress.” Each semester brought new challenges and things learned from the previous semesters. These were incorporated into the syllabus for that semester.

Use a Real Case

The first semester the course was taught we used one of the college properties that students had already been on. The feeling was that this would make it easier for the students since they knew something about forest types,

soils, boundaries, and access. However, in order to simulate management objectives, we gave them four different hypothetical situations and had each team work on a different one: non-industrial private owner, forest industry, public agency, nongovernmental nonprofit organization. We learned that this took away much of the interest in the course. Subsequently, a real case with real owner objectives has always been used. Interest by the students has been much higher. Furthermore, the real case also introduces the student to the vagaries of owner objectives and trying to work with clients.

Owner Objectives

It is very helpful to have clients who have general multiple-use objectives and are not bound to any narrow pre-determined, single-purpose goal. For example, when working on the Sterling Nature Center, the managers stated that no timber harvests would occur. However, in order to maintain the other values, tree cutting is necessary (wildlife habitat, visual corridors, maintain early successional vegetation, etc.). The students had difficulty thinking about how to manage and had to be encouraged to develop management plans that did incorporate cutting. Their added job was to show the client how such cutting enhances the other values desired. On the other hand, whatever the objectives are of the owner/client, this is what the students must deal with. This is the reality part of the course.

Geography

At Syracuse, the course is taught along with many other courses that semester. As such it is virtually impossible to schedule the course for a full day. It must share the day with other lectures, labs, etc. However, at least one site visit is done for each team with the instructor accompanying them to introduce them to the property and to point out various management alternatives and any unique circumstances. Therefore, properties must be located within one hour's drive from campus. Students cannot be "required" to use their own transportation to visit the site, but they want to and desire to make site visits at different times, for example, Sunday morning. They will do so if the travel is under one hour. Another geographical consideration at Syracuse is the weather. This means that during the "Spring" semester (January 15 to end of April) one needs to avoid sites north of Syracuse on the Tug Hill Plateau, which are subject to extremely heavy snows. In addition, sites for the "Spring" semester need to have good, all-weather access. These are not constraints in the Fall semester.

Team Size and Composition

A variety of team sizes and methods of selecting team members has been tried. The best team size appears to be three people. Four and five will work if the team members are all outgoing and fully committed to the task. However, a smaller team is preferred if logistically possible. Students can be allowed to select their own team members, but this does not seem to be an optimal method. Random selection of student team members or purposeful selection of students to be on teams based on background, personality, skills, etc. is preferable. The former (random selection) is easy; the latter (purposeful selection) requires prior knowledge of students or having a good database from each student at the beginning of the semester.

Instructions to Class

Students come into the class with a general history of being told what to do, the form for final reports, what data to collect, how to report them, etc. In many courses forms or fill-in sheets are used in lab or homework exercises. In the Integrated Resources Management course we have resisted giving detailed instructions. As one student once put it, "You throw us into the deep end of the pool and tell us to swim out." This is indeed part of the learning experience. Students are expected to figure out what data they might need, how to obtain that data given the limited time and resources in the semester, what kinds of recommendations to develop, how to evaluate the alter-

natives, and how to present their findings. At first no further instructions were given. However, as time went on we found it useful to give students certain deadlines and to require certain items. At present I require the following items from students:

1. A written work plan from each team early in the semester setting forth how the tasks will be completed.
2. A journal or record of work done by each student due at mid-semester and at the end of the semester. Also included in this journal are impressions of how well the team is functioning, and if all members are contributing to the effort. The journals are not seen by anyone other than myself but are useful in assessing how well particular teams are functioning and spotting early personnel problems to take corrective action.
3. Certain items are specified in the final report, depending on the particular case. For example, an analysis of growth and yield for a particular stand is often required using a computer growth-and-yield model. Usually TWIGS as embodied in the NED/SIP computer package is used since this is what the students have used in an earlier forest measurements course.
4. A preliminary presentation, or “dry-run” of the final oral and visual presentations is always done. At these preliminary presentations the team is given a critique. This is done with all students present so that each can learn from others’ problems.
5. New this year is the “service-learning” component. Each team will prepare a one- or two-page typed paper that reflects on how the case and work on it may have contributed to the growth, development, or enhancement of the local community. These reflective papers will be shared with the entire class.

Resource Information

Having data available is a problem. Students do not have the time to gather large amounts of data and still develop management alternatives, evaluate them, and prepare a final report within the scope of the semester, given the large scale of several cases. In addition, it is not realistic to have all information readily available. One valuable lesson the students learn is that in the “real world” one might not have all information desired! Any information that does exist for the particular case is noted or assembled for students’ use. For example, when working on the state forest, a detailed type map and vegetation inventory were available. However, this was not true for other cases. Aerial photographs and U.S. Geologic Survey topographic maps have always been available and sometimes digitized imagery. Students have had an introduction to Geographic Information Systems and they are encouraged to use the technology, but not required to. For soils information the students are referred to the USDA soil surveys available in our college library. The guiding rule is if students feel they need information, they must find it or do without.

Separate Cases vs. One Case

Some semesters several small properties have been used as cases with each team working on a different property. This has usually produced the best results both in terms of student products and student interest. The more detailed student performance is also more satisfactory to the client. However, logistics tend to interfere with this. Given a large class it becomes extremely difficult for one instructor to take students to up to a dozen different sites early in the semester. Working with several teams on one large property has been satisfactory by dividing up the property into smaller areas. Students can then feel a sense of ownership for their area, and it is small enough for them to cover the area and get to know it. However, at the end, the client is given several sets of plans or recommendations, each for a different area. Clients either need to understand this or some combining of individual team reports into a unified property-wide plan is required by the instructor or by other students.

Working with a Client

There have not been any problems with the clients. Indeed, all have been satisfied with the students' work and thankful for some assistance. The client is told at the outset that these are students and that it is primarily a "learning experience." An initial meeting is held with the client and the students, usually on or near the client's property. Further contact between the students and the client during the semester is permitted, but students are counseled to get their questions specific and to not overburden the client with requests. Discussion between the students and the instructor usually precedes any contact with the client.

USING THE COURSE TO ASSESS THE PROGRAM

The Faculty of Forestry at Syracuse developed a comprehensive set of "Professional Concepts and Skills" that the faculty felt all students should possess by the time they graduate from the Forest Resources Management program at the B.S. level. For each concept or skill, a cognitive level can be achieved (based on Bloom's "Taxonomy of Cognitive Levels"). These levels are

1. Knowledge	Remember facts, terms, concepts, definitions
2. Comprehension	Explain, predict, interpret, infer, summarize, give examples
3. Application	Apply, solve problems, modify, demonstrate
4. Analysis	Break down material into component parts to see interrelationships
5. Synthesis	Produce something new or original from component parts
6. Evaluation	Make a judgment based on set of criteria, appraise, judge

based on consideration of how students performed in the Integrated Resources Management course. The median level achieved by the class was estimated along with estimated high and low. What follows below are the comments on how students performed on each of the "Professional Concepts and Skills."

Understanding Forests

Students generally had a good grasp of relationships among different biological forest elements and how to identify species. It is difficult to apply Bloom's "Taxonomy" to this concept area, especially as it applies to levels 3 and above. The students' use of soils information was variable. Some just mention the particular soil series, which suggests just a parroting of material found in a reference. Others use the soil information in management decisions.

Manipulating Forests

Students seem able to understand different ways of altering ecosystems. However, they do not appear very imaginative as far as developing new ways to manage the vegetation or applying techniques discussed in one context to another set of species. In the course different treatments were mentioned on field trips and in class discussion. In the student reports and presentations it is difficult know if the students really comprehend techniques such as mowing, disking, or controlled burning, or if they are just repeating what they heard.

Measuring Forests

Students appear good at identifying tree, lesser-vegetation, and animal species. They can apply known techniques in forest inventory but seem uncomfortable with a quick overview of one or two point samples to get some idea of stand conditions. Knowledge and use of computer growth-and-yield models is extremely variable. Some students seem at home with the computer side of the model but do not make the connection with applied

management. They do not see the models as being of use in decision making. Other students do not comprehend what the models can or are doing. They just go through the motions. Finally, a few students have the near-full comprehension of how to use a computer growth-and-yield model in forest management planning and decision making.

Managing Forests

This appears to be a weak area for some students. They are good as describing but not so good at evaluating and making choices. In their defense, for the class project this semester they were asked to give recommendations and not make a definite decision. However, many students were able to bring in different aspects of the management situation and address owner concerns and objectives. Ability to correctly apply and use quantitative investment analysis tools is extremely variable.

Policy Making

This was a difficult criterion to evaluate in the FOR 490 course. However, many students seemed to realize that some group would make final decisions and that some process would be involved. Many seemed to grasp the notion of the biological history of the forest, but it is unknown if the social history of land use and the changing policy-making climate over the years is understood.

Communicating

This skill area is very variable among students. All students do seem to recognize that they need more practice with public speaking. Written communication and oral presentations were quite variable for the rough drafts and dry-runs, among student teams. However, students responded well to the comments made on their drafts, and the final products were much improved.

Ethics and Leading

These two concept areas are grouped together for discussion. Students functioned well in teams. They put a conscious effort into completing the assignments, and material was usually turned in on time and in a professional manner. The required journals and evaluations of their team members showed thought and working together.

Problem Solving

Students can perform problem solving. The main area needing improvement is to get them to recognize that each part of their education must be integrated together in the final real-world problem solution. In addition, getting students to think innovatively rather than just applying blindly something they have had in a course is challenging.

Overall Conclusions Regarding Assessment

The students in the current senior class in the undergraduate Forest Resources Management program at SUNY-ESF perform at a passing level for graduating B.S. degree holders. However, more emphasis should be placed in our curriculum on critical analysis of one's use of terminology, writing and oral presentation skills, and getting students to really understand and be able to apply material they have been "exposed" to.

The various concepts and skills seem to be capable of application to assessment both at the course and program level. A recommendation would be that each instructor try to assign achievement numbers (cognitive level reached) for each course taught. At least it would seem very useful to do this for certain integrative types of courses.

SUMMARY

As a final footnote, a few comments from the student evaluations of the course seem in order:

- A few students commented that they would have liked a property that had more of a timber emphasis because that is what their curriculum has focused on for the last four years.
- The exercise of working together in a group was seen as generally a very good experience.
- Students often commented that they really did not learn anything new in this course but did get to apply previous knowledge.
- The use of a real case is seen as very good.
- Some students would have liked to be given more specific instructions as to exactly what was “required” in the way of a timber cruise, soil survey, etc.
- One student commented that we should involve students from the environmental biology program since, “they know more about preserving biodiversity and wildlife management than forestry students. Why not truly integrate all levels of natural resources management.”

AN ONLINE FOREST BIOLOGY AND TREE IDENTIFICATION GRADUATE CLASS FOR PUBLIC SCHOOL EDUCATORS

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ABSTRACT: As a result of certification and accreditation standards, public school teachers are often required to take graduate education courses. However, it is often difficult for these teachers/students to take courses in residence at campuses. Further, there is often a shortage of specialized courses in their area of teaching. There is also a demand for natural-resource-based classes since, in Virginia, many of the standards of learning can be effectively taught using examples from forests. In response to the above issues, we developed an entirely online graduate course that covered forest biology, management, and tree identification. In the summer of 2001, 24 students successfully completed the course. Students were required to learn to identify 80 trees and shrubs in nine separate groups. They were also taught tree growth and structure, reproduction, carbon uptake, water relations, growth regulators, cold hardiness and dormancy, soils and site productivity, and silviculture. The course content was delivered on three CD-ROMS and administration occurred through a Web site. Nine cumulative tree ID quizzes were given online as well as two comprehensive exams covering the tree biology topics. We will present the basic structure of the course, class administration, share insights and student feedback.

ADULT LEARNERS' PERCEPTION OF OUTREACH PROGRAMS DELIVERED BY VIDEO TELECONFERENCING

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Information transfer technologies, such as multipoint video teleconferencing, offer a new paradigm for outreach and extension, but little is known about their success in delivering information to an Extension client. North Carolina State University Extension Forestry used a post-evaluation to evaluate the use of multipoint video teleconferencing to deliver four workshops to two remote locations in North Carolina, targeting natural resource professionals. Study results indicate that the participants perceived a high level of satisfaction with the information received and that video teleconferencing technology does not appear to lessen the level of satisfaction for those participating through remote site.

LEARNING AND LIVING: CONNECTING GRADUATE EDUCATION IN NATURAL RESOURCES WITH THE SCHOLARSHIP OF ENGAGED LEARNING INSTITUTIONS AND THE OUTREACH MISSION OF LAND-GRANT UNIVERSITIES

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ABSTRACT: The future will involve a lifetime of learning for those who intend to work or live meaningful, productive lives, especially in the fields of natural resources management. Land-grant universities always have recognized this need for lifelong learning of both professionals and citizens. In order for land-grant universities to reach their full potential as learning institutions engaged with communities, they will need to initiate new forms of leadership within an expanded paradigm that maintains core values while altering the way they serve their students and public. New educational models are needed at the graduate level in natural resources. These new models should be designed to meet growing demand among learners for direct application of content to work settings, and for greater understanding of the dynamic complexity and often-interdisciplinary nature of knowledge. There is also the need to develop capacities among our graduate students for partnership building and leadership for change.

So, what is the role of an emerging natural resources “scholar” in relation to society? How can we best prepare graduate learners to have a “fire in their belly” for the important outreach functions they will serve, either as faculty at engaged learning institutions or as resource managers serving citizens? This paper considers administrative, faculty, and graduate students’ views. A summary of experiential learning, service learning, and situated learning theories provides a framework for engaging graduate learners for a lifetime of outreach work within

natural resource management. Course models for a graduate orientation session, a 1-credit seminar, and a 3-credit course are highlighted. Our work at two diverse institutions focuses on learning for living—connecting student learning to real-life outreach to address resource management issues.

INTRODUCTION

Many believe that we are going through a period of change in our civilization and its educational institutions just as momentous as that which occurred in earlier times such as the Renaissance or the Industrial Revolution. Slowly, but surely, the nature of even the most traditional institutions will change.

What is driving this change? One factor is the Kellogg Commission on the Future of State and Land-Grant Universities (1999). This commission's report challenges higher education to engage more effectively in meeting community needs. In higher education, we have already changed our vision by de-emphasizing teaching and instruction, and re-emphasizing learning and effective strategies for promoting learner-centered processes (Fear et al., 2002; Ryan and Campa, 2000). Now, the Kellogg Commission asserts, higher education requires a similar realignment away from traditional notions of outreach and toward engagement.

Engagement refers to

“institutions that have redesigned their teaching, research and extension and service functions to become even more sympathetically and productively involved with their communities...Engagement goes well beyond extension, conventional outreach, and even most conceptions of public service....[E]mbedded in the engagement ideal is a commitment to sharing and reciprocity. By engagement the Commission envisions partnerships, two-way streets defined by mutual respect among the partners for what each brings to the table.” (Kellogg Commission, 1999, p.9)

The driving questions for this paper are

- How can we foster, nurture, and help our graduates practice outreach and engagement, and do so over a lifetime with a “fire in their belly?”
- What will benefit today's developing professionals, the people they serve, and the resources they strive to improve, use wisely, and protect?
- How can we change institutions?

THE ROLE OF A SCHOLAR IN SOCIETY: WHAT DOES THE CURRENT DIALOGUE ON “ENGAGEMENT” MEAN FOR NATURAL RESOURCE PROFESSIONALS?

In this time of great change and shifting paradigms, land-grant universities must consider the changing nature of the higher education enterprise, itself. We must take great care not simply to build on past successes, but instead to examine the full range of possibilities for the future. Faculty members of the future, particularly in highly applied and rapidly evolving fields such as natural resources management, will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments. Further, today's faculty are learning to discard the present style of solitary learning experiences in which students tend to learn primarily on their own through reading, writing, and problem sets. Instead, faculty-coaches are developing collective learning experiences in which students and faculty work and learn together, in communities of practice.

In the near term, traditional models of Extension education will coexist with new learning paradigms, providing a broader spectrum of learning opportunities in the years ahead. The transitions from student to learner, from teacher to designer/coach/consultant, and from alumnus to lifelong member of a learning community are occur

ring. And with these transitions and new options will come an increasing ability and responsibility to select and design the learning experience.

Nowhere in academe are these endeavors for change more important than in preparing our natural resources graduates for the full scholarly integration of outreach into their work. Fisheries, wildlife, and resource management professional environments have changed markedly. Over the past two decades, there has been increased recognition for the importance of public communications and human dimensions of management. Recently, at our two institutions, transformations have occurred that attempt to take our learners closer to the heart of true engagement of scholars with their communities. The role of the scholar in society today is to share and engage with a multitude of partners and community members to apply the best knowledge possible to resolve complex resource management issues. A critical question is how can we bring this role into the learning space of the graduate student in natural resources?

LEARNING THEORIES FOR FOSTERING ENGAGEMENT OF SCHOLARS

Several theories can provide the basis for our work in preparing graduate students for leading lives of scholarship in outreach, extending their knowledge for the benefit of society. Most faculty are already aware of experiential learning theory, and practices that are based in this theory. This theory views learning as requiring active involvement of learners in more than just passive reception of information. Instead, learners cycle through several stages, such as having a concrete experience, observing and reflecting on that experience, forming abstract concepts and generalizations, and testing hypotheses in new situations (see summary by Knapp, 1992). In short, learners are asked to “pre-flect” or to think prior to their experience, then to “do,” then to reflect upon and make meaning from that experience. In reality, however, the learning process is not “flat”; rather it is more like a helical Slinky[®] toy, with cycle after cycle, and meaning and growth spiraling up over time. In addition, faculty members should probably be “cycling upward” with their students, sometimes with the students leading the way!

Under the “umbrella” of experiential learning theory, service learning offers another specific theory and research base. Simply put, this theory provides for integration of academic (content) learning with true involvement of the learner in service activities that meet actual community needs (MSU, 1998-1999; Woods, 2001). Service learning includes the processes of doing and reflecting, but goes beyond basic experiential learning. Service (through a real experience) is viewed as *essential* for learning. Learning new information is not the main end goal; instead, major learning goals are to foster in students the senses of care, belonging, personal worth, and civic responsibility (MSU, 1998-1999; Woods, 2001). Philosophically, another important element is that students are not viewed by faculty as “future citizens”; rather, when using service learning, faculty value students’ potential as active, caring citizens bringing their knowledge and expertise to meet the needs of community in the present.

The newest theory that can inform our work as co-learners for a lifetime with our students is that of situated learning. This theory views learning as “a way of being in the world, not [just] a way of coming to know it” (Hanks, 1991, p.24). Learning is “situated” in the processes of co-participation with a community of co-learners; learning is not merely a cognitive, individual phenomenon in the heads of the learners (Lave and Wenger, 1991; Wenger 1998). The educator then, as a facilitator, asks not what cognitive structures or processes to provide learners; instead, the question should be what kinds of social contexts provide the best environments for learning? Situated learning theory views that the social environment for learning includes both “masters” and “apprentices” who are involved in complex relationships of sharing over a length of time. In addition, there are those who are peripheral to this community, either just coming into the group or remaining at the “fringes.”

Using this theory in our learning environments involves the intentional building of “communities of practice.” A community of practice is a “new organizational form...groups informally bound together by shared expertise and passion for a joint enterprise” (Wenger and Snyder 2000, p.139). Members of communities of practice “share their experiences and knowledge in free-flowing, creative ways that foster new approaches to problems” (Wenger and Snyder, 2000, p.140). Many organizations—business, educational, and community-driven groups—are using this approach to drive strategy, identify new product lines or services, solve problems,

promote the spread of best practices, develop professional or personal skills, and recruit, retain, and mentor newcomers to the group. (For specific techniques in developing communities of practice, see Wenger et al., 2002.)

But there are some paradoxes inherent in using situated learning theory to foster growth and learning. From a managerial perspective, a paradox is that true communities of practice should emerge and ebb and flow, rather than be mandated. Within our courses and our professions, these groups should be tended and nurtured, much like a garden grows best with informal nurturing and guidance; the groups should not be required and over-supervised (Wenger and Snyder, 2000). Another paradox is that fostering communities of practice takes courage to break away from the traditional notion of an “expert” teaching students. Faculty are viewed as co-conveners, meeting along with their community of learners, and willing to learn and grow with their students as they jointly view the subject (or “great thing”) at the center of their focus (Palmer, 1998). In this model, “good teachers possess a capacity for connectedness. They are able to weave a complex web of connections among themselves, their subjects and their students, so that students can weave a world for themselves” (Palmer, 1998, p.11).

COURSES AND A LEARNING MODEL FOR GRADUATE EDUCATION FOR ENGAGEMENT

At Michigan State University, in our Department of Fisheries and Wildlife, we have been involved with three approaches to using these learning theories and fostering involvement of our graduate students in outreach. These three opportunities are

- a non-credit, required graduate orientation for all students (with an hour-long experiential session on the outreach mission of our land-grant universities);
- a one-credit graduate seminar on “Best Practices in Fisheries and Wildlife Outreach”; and
- a three-credit course, “Outreach in Fisheries, Wildlife and Natural Resource Management,” which may be used to fulfill our department’s graduate requirement in Human Dimensions.

In all three offerings, similar topics, processes, and contexts emerge (Figure 1). The first question is what will be the academic content of the offering? Even in the short, one-hour session for all graduate students, the session begins with the critical question: What is or should be or could be the role of the scholar in relation to society?

For all three graduate offerings, the rest of the academic content includes

- theory informing outreach (e.g., experiential learning, situated learning and communities of practice, environmental education, persuasion, diffusion);
- land-grant university history, heritage, mission, and future policy outlooks;
- specific fisheries and wildlife outreach programs and associated research bases; and
- research-based best practices, and practical experiences in outreach techniques (Figure 1a).

However, just as attention is given to the content of the offerings, more attention goes to the design addressing what Wenger and his associates believe is important: what social contexts to provide in order to enhance learning. These social contexts for learning lie at the “heart” of the model (Figure 1b). These experiences all start with significant “pre-reflection,” allowing learners to think carefully about what it is they believe, hope to gain, hope to share with their community of learners, and where they hope to go with their learning experience (Table 1). Likewise, there is ample time sprinkled throughout for reflection after the community of practice has specific learning experiences, either through active learning in the actual meeting, or through the experiences of assignments or field trips with the group. Finally, as is the case with all graduate teaching, a significant element of our co-learning is the practice of scholarly thinking. This occurs through reading for depth of meaning (e.g., Book-of-the-Month Club™ assignments), and scholarly writing integrating the learners’ personal meanings with those

of the “great” writers and thinkers in outreach, resource management, and environmental philosophy. At this “heart,” this core, we are fostering in our community of learners the “ways of being” that Wenger and his associates say are so necessary for true learning. We are fostering habits of mind, and at the same time providing for learning that is transferable when these students grow to become members of other communities of practice, with agencies, universities, and nonprofit organizations. Finally, we are providing for learning that is transformative, touching the soul both professionally and personally, changing views of the role of engagement in community. Thus, in the long run, we perhaps are transforming institutions to have greater value in their engagement with community.

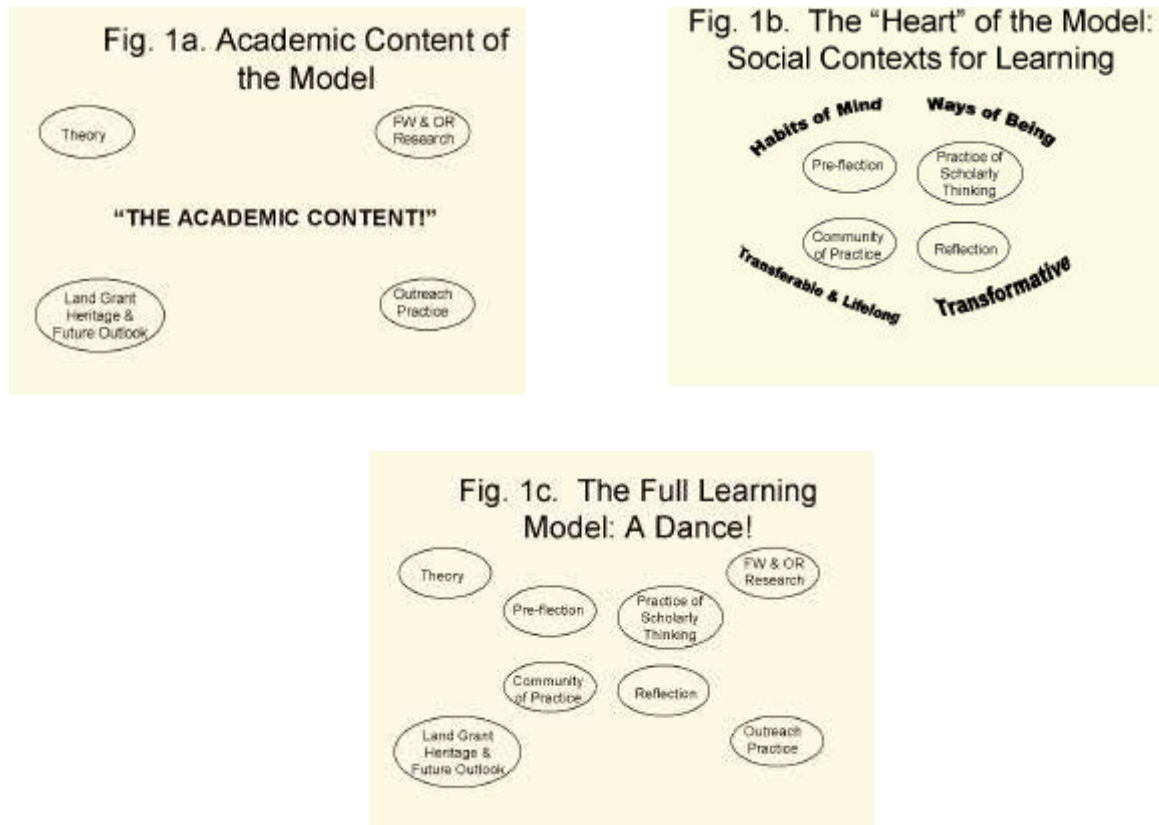


Figure 1. Fisheries and Wildlife Outreach at the Graduate Level: A Learning Model

How do these elements interact? Putting the model together, we have several elements of the learning experience, and we could draw the requisite arrows and lines attempting to show direct interactions and a linear process among the elements. Rather, the best vision of this process, integrating the academic content of outreach in resource management with the learning contexts of community and reflection, is really like a dance (Figure 1c). Picture a folk dance, where there is spinning motion, from one partner to another, from content back to community, from scholarly thinking practice, to the specifics of the land-grant heritage. The topics and the learning processes dance among the community members certainly during each week of our 3-credit course, and sometimes within one class-meeting period. The before- and after-class discussions focus both on the content of the course experience (i.e., environmental education research and how it informs outreach practice), and on the dynamics of who is doing what for their next outreach practical, community-based program and on the personal stories of our most recent field trip adventures!

REFLECTIONS ON LEARNING FOR A LIFETIME: FOSTERING GROWTH AND CHANGE IN OUR LEARNERS, CHANGING OUR PROFESSIONS, CHANGING OUR INSTITUTIONS

How do students, our co-learners, our community of engaged outreach practitioners, react? Their insights (shared, here, with permission of the writers) and their outreach products are remarkable, showing the potential for this sort of collaborative venture in learning to matter for our society's natural resource problems.

One student writes this in his end-of-semester statement of professional and personal philosophy of outreach in fisheries and wildlife:

“Community-based management of resources fits nicely into my conservation education philosophy. Since the focus of community-based management is on local resources, conservation education programs can concentrate on increasing knowledge, attitudes, and behaviors toward wildlife and other natural resources of the area. Learner-based activities that allow participants to have meaningful outdoor experiences, which increase knowledge of resource issues and strategies for resource management, near their own homes, will cause positive changes in the variables that determine environmentally responsible behavior. My conservation education philosophy has not only been shaped by my own experience and environmental education theory, but by my own experiences as a lifelong learner....”

Writes another student:

“It is important to remember that, although as educators we want to foster positive environmental attitudes in our learners, it is imperative that learners are encouraged to make their own decisions. Allowing learners to come to their own conclusions rather than being told what to think will help to nurture the sense of ownership that a particular citizen has over an environmental problem. This is something you can see in every day life; people often are much more engaged in activities that they choose to do rather than ones that they are told to do....Outreach for environmentally based organizations is particularly important due to the fact that they want to appeal to their constituents and neighbors. Extension and outreach programs across the country have successfully incorporated behavior change educational theory models in their programs...For example, Extension programs develop local partnerships in offering outreach focused on helping people make responsible environmental decisions about local conservation efforts such as habitat preservation and improvement.”

Regarding their experiences in the graduate seminar, students write that they found that the most engaging parts of the seminar were “the conversational nature...casual, all opinions valued.” Another observes that “getting to know the classmates better and working with people has been a real joy. There isn't any pressure to perform like a dancing bear in this class. I like the fact that it's relaxed and that we are covering a large base of material.” Students comment positively about the impact of their learning on their views of outreach and engagement. They state that

“The work we have done on our applied outreach project has been the most enriching, engaging and enjoyable experience for me. I think it really speaks to the experiential learning concept. As soon as I was the one trying to apply the things we have been learning, it all clicked for me. The first days were also enjoyable for me. I love getting to know new people and exploring new things. I got to do both of those in the first couple of weeks, and am continuing to do so.”

“We all get called upon to share our knowledge with others. This can come in the form of conversation, informal presentations, meetings with community groups, youth programs. As holders and producers of knowledge, we need to be effective at communicating it—I feel this is our responsibility!—And since there is a body of research on outreach theory and practice, we need to take advantage of that to best communicate.”

These quotes illustrate that this approach to graduate education is relevant for learners wishing to grow in their abilities and confidence to extend knowledge for the benefit of society, for new professional resource managers, and for the land-grant institution in its quest for “engagement.” Today, more than ever, learners in the natural

Table 1. Specifics of learning experience design for three different graduate offerings in fisheries and wildlife outreach at Michigan State University.

	Graduate Offerings in Fisheries and Wildlife Outreach		
	1-hour orientation	1-credit seminar	3-credit course
ACADEMIC CONTENT			
Theory	PowerPoint: Experiential Learning Theory, Examples of FW Programs, Ways of Doing FW Extension, MSU's role as "Pioneer Land-Grant College"	Student-led presentations and products for peers on specific theory	Lectures, readings on theory base
Fish/Wildlife Outreach Research		Student-provided examples; readings from Fedler, 2001	Readings, reflection, application to professional and personal interests
Outreach Practice		Skills: Facilitation, program planning, working as and in community	"Fabulous Fridays": guest lecture, field trips to outreach sites
Land-Grant Heritage, Future		Interactive activity with notable events posted on wall	Readings, lecture, interactive activity, guests
WAYS OF BEING, KNOWING			
Pre-lection	<u>Experience:</u> Learning Style Inventory and Discussion of Learning Theory and Implications for the Role of a Scholar in Bringing FW Knowledge to Benefit Society	Exploration of personal and professional learning goals	Exploration, and in-depth discussion of lifelong learning experiences, goals
Practice of Scholarly Thinking		Literature review and summary on outreach topics, prepared for peers	Readings: "Book of the Month Club", Leopold, Carson, others; written book review for scholarly peers; reading, writing about outreach "classics" and cutting-edge work
Community of Practice		Group planning and implementation of an original outreach program, as service	Group dialogue; outreach/service products shared with peers
Reflection		Sharing of group outreach program, seminar debriefing	Course debriefing; take-home exam asks students to write personal professional statement of outreach philosophy, practice

resources professions recognize the need to apply their knowledge base to real, not contrived, community-based issues and challenges. Now is the time for faculty, students and their institutions to support true, authentic engagement through viewing the learning process through the use of situated learning theory. To do this, we must strengthen our work in fostering communities of practice within natural resource management that value outreach and extension of knowledge for the benefit of local communities. When we use this approach to the learning process, it is more likely to become a habit of mind, a habit of practice for our students, our co-learners, in turn, to use this approach when they apply their knowledge. We then help our graduates view knowledge as complex and interdisciplinary and themselves as sitting with community, as co-learners with their constituencies to solve the problems we face now and into the future.

This sort of graduate teaching about outreach in natural resources requires the courage to give up the formal, traditional structures of graduate education of the past, and to model the formation of communities of practice. As we welcome a continual interaction of new perspectives, “everyone can to some degree be considered a ‘newcomer’ to the future of a changing community” (Lave and Wenger, 1991, p.117). We are moving beyond traditional experiential education, service learning, and Extension into a new realm of authentic engagement of natural resource scholars within communities of practice to generate outreach that really matters. This meaning is real and essential, for both our students who will be lifelong learners in a changing world, and for the changing world itself.

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ACHIEVING SUSTAINABLE FOREST MANAGEMENT AND CERTIFICATION IN THE SOUTHEAST: DEVELOPMENT OF A DISTANCE LEARNING COURSE

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ABSTRACT: The paper will summarize our new effort to develop an integrated distance education/professional education course on forest certification and sustainable forest management (SFM) in the Southeast. The course will present a practical, applied view of the elements of forest certification for private forestlands in the Southeast, as well as a review of the SFM criteria and indicators. The innovative course design will present the material in five different modules, covering international SFM agreements, forest certification systems and processes, social and biological issues in certification, and certification process and record-keeping requirements.

EXAMINING RELATIONSHIPS BETWEEN FORESTRY LEARNING AND STUDENT BACKGROUND

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ABSTRACT: Understanding how background characteristics of forestry students are related to forestry learning can help guide curriculum modifications to enhance learning potential. An increasing number of Southern Illinois University-Carbondale (SIUC) undergraduate forestry students are originating from small cities and larger urban areas. The purpose of this study is to characterize student background and outdoor experience as related to performance in aspects of the SIUC Forestry curriculum and student perspectives on forestry activities. A survey was conducted over two cohorts (n = 97) of Tree Identification Laboratory classes in 1999 and 2000 (a third cohort will be surveyed in Fall 2001). Demographic and experiential background variables were examined for relationships with student performance, learning preferences, and attitudes toward forestry-related terms. Ninety-eight percent of participating students were residents of Illinois. No student reported a parent employed in a natural resource management profession. Preliminary analysis indicates that while childhood residence was an unreliable predictor of course performance, both childhood residence and primary outdoor activity were related to attitude scores assigned to timber harvest. If outdoor experience is found to be positively related to performance, increased opportunity for field activities may be particularly important to the increasing number of students hailing from urban/suburban residences.

TEACHING SILVICS: STUDENT PERFORMANCE AND EVALUATIONS IN WEB-BASED AND TRADITIONAL CLASSROOM COURSES

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ABSTRACT: There is interest in Web delivery of lower-division forestry courses at Northern Arizona University to accommodate transfer students and scheduling conflicts. We have taught "Trees and Forests of North America," a sophomore-level required course for forestry majors, for five years with good results as measured by student performance on exams and student evaluations. Fall semester 2001 marks our first completely Web-based version of the course; 25 students enrolled with 30% of the class residing outside of the Flagstaff area. Students covered the course material using a combination of linked Web sites and a commercially available dendrology CD set following a weekly schedule based on the classroom course. We used student evaluations and identical test questions to compare student performance in the Web-based and classroom courses. These data provide a preliminary indication of the feasibility of using a self-directed, Web-based approach to teaching silvics in forestry curricula.

DEVELOPMENT OF A PROGRAM ASSESSMENT SYSTEM AT THE SUNY-ESF RANGER SCHOOL: THE PROCESS, EARLY RESULTS, AND ANTICIPATED BENEFITS

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ABSTRACT: For the past two years, faculty at the SUNY-ESF Ranger School in Wanakena, New York, have been working with education consultants from Pacific Crest, Inc. to improve the quality of their teaching, their courses, the curriculum, and the Ranger School program in general. The ultimate goal of such efforts is to improve the quality and enhance the success of the school's graduates. The faculty's formalized efforts to improve quality have been focused most recently on the design and implementation of a Program Assessment System (PAS). The PAS developed for the Ranger School clearly articulates the enduring *mission* of the school, prioritizes the five-year *goals* of the program, and explicitly states the key *criteria* that will be used to assess and improve student, faculty, staff, and program performance. Further, the PAS clearly indicates the *measures* that will be used to compare actual performance against the stated standards. Representatives from the faculty, staff, administration, and alumni participated in the design of the PAS since all were recognized as having critical influence over program quality. This team approach fostered the development of a modernized and shared sense of purpose and direction. Equally important, it provided the entire group with the means to measure and evaluate in the years ahead whether the increased program quality they seek is being achieved. This paper describes in more detail both the process used to design a PAS and the specific components and measures that became part of the Ranger School's PAS. If maintained, the PAS will, by design, provide the type of data, information, and self-assessment increasingly requested by external accrediting organizations, prospective students and their parents, alumni, and the public in general. Equally as exciting, it will continue to unite and propel the faculty, staff, and administration toward a shared mission, shared goals, and a collective desire for quality.

INTRODUCTION

For many years, and for many reasons, we, i.e., academics and the bodies that accredit academic programs, focused on inputs as the criteria on which we evaluated the quality of our programs. We focused on enrollments, course registrations, grades of incoming students, contact hours, textbooks used, number and quality of faculty, etc. In recent years there has been a shift toward evaluating quality based on more direct and meaningful criteria, such as knowledge or skill levels of graduates, job placement rates, alumni satisfaction, employer satisfaction, etc. In other words, instead of focusing on what goes into the process of education, we have increasingly found the need to focus on and monitor the outputs and outcomes of our educational efforts.

As we began to focus on outcomes—for example, on the ability of a student to write a well-organized, substantive, and grammatically correct paper—we began to see that our hopes and expectations were often not being met. The latter discovery led us to our interest in assessment or, more specifically, to our interest in "outcomes-based assessment."

I would argue that the Ranger School, and probably every other school represented here, has been engaged in "outcomes-based assessment" all along. But at the Ranger School, at least, it has been an informal, inconsistent, and incomplete engagement. And it rarely, if ever, has involved the entire faculty and/or staff. Now, in the twenty-first century, such an assessment effort is not acceptable. For reasons I will outline below, we need and/or desire a formalized assessment system that is well designed, regularly implemented, and easily used and understood.

The purpose of this paper is to describe our efforts at the Ranger School to develop a "Program Assessment System" (PAS). More specifically, I would like to define what a program assessment system is, explain our reasons for developing one, describe the process we used to develop one, and provide you with an overview of what our PAS looks like at the current time. A final but equally important purpose for presenting this paper is to share with you some of the insights gained and benefits realized by engaging ourselves in this process. Through this sharing I hope to contribute to the development of what has been called "institutional best practices in student assessment" (Peterson and Einarson, 2001), but what I will call "institutional best practices in *program* assessment."

DEFINITIONS

Before going any further, I would like to define some terms that are pertinent to this discussion.

Assessment: The purpose of an assessment is to provide feedback to improve future performance or work products (Apple and Krumsieg, 2001).

Evaluation: Unlike assessment, the purpose of an evaluation is to determine or judge the quality of a performance or work product (Apple and Krumsieg, 2001).

Both processes, assessment and evaluation, involve collecting data, but what is done with the data in each process is very different. Evaluation is a commonly used process in academe. Exams, grades, GPA's and tenure are examples of evaluation, as is the accrediting of a college curriculum by an accrediting body such as the SAF. The goal of evaluation is to make a judgment or determination of if, or to what level, certain standards have been met (Apple and Krumsieg, 2001). The goal of assessment, by distinction, is the growth and improvement of the assessee.

Program: For the purposes of this paper, the "program" is the Ranger School. The Ranger School, being remotely located and geographically separated by 150 miles from its parent institution, is not a department, but rather a full-service campus. As such, the "program" consists of students, courses, curricula, budgets, faculty, staff, facilities, food, forest, equipment/vehicles, alumni services, public service activities/events,

and research projects/activities. We quickly learned that a meaningful and comprehensive PAS would need to address all of these components, since they are inextricably linked.

System: According to the *Oxford American Dictionary*, a system is a set of connected things or parts that form a whole or work together. A system, moreover, denotes orderliness and implies cooperation and adaptability based on feedback.

Program Assessment System: A program assessment system is a dynamic, ongoing set of processes used to improve the performances and outcomes of a program, whatever its size and scope (Apple and Krumsieg, 2001). The processes incorporated into a PAS are as follows (Apple and Krumsieg, 2001):

1. determining goals and objectives
2. reviewing current program quality
3. defining measurable outcomes
4. establishing performance criteria (standards) by which to gauge outcomes
5. developing instruments for collecting data
6. collecting the data
7. analyzing the results
8. determining future steps in light of those results

GENERAL REASONS FOR ASSESSMENT

A recent survey of about 1,400 postsecondary education institutions in the United States revealed that the most important purpose for engaging in student assessment activities was to prepare for accreditation self-study (Peterson and Einarson, 2001). Other reasons for engaging in assessment include, but are not limited to (adapted from Apple and Krumsieg, 2001):

1. providing feedback to improve future performance/product (internal improvement)
2. meeting state reporting requirements
3. justifying and/or documenting value of program
4. improving marketing of program (by documenting quality and continual improvement)
5. obtaining support for increasing or adding additional programs
6. clarifying a mission or adherence to a mission
7. connecting philosophy to practice

RANGER SCHOOL'S REASONS FOR ASSESSMENT

To his credit, Bill Bentley, chair of the department that administers the Ranger School's academic programs, initiated the program assessment effort in a very subtle and non-threatening way. I think, however, that he felt the winds of change perhaps before we did, and was motivated to get us involved with assessment because of the impending changes in the accreditation process. But for the faculty at the Ranger School, it was nothing more than genuine interest in and self-motivation to continually improve ourselves and offer our students the best education we are capable of at any given time (i.e., our motivation was internal improvement). It was also a logical next step for us as we learned more about and attempted to implement "process education" (Apple and Krumsieg, 2000) and improve our student's critical-thinking skills. So we started off with the intent of making our students better critical thinkers, and in doing this, we began to critically think about what we do, why we do it, how we do it, and about how all of the components of our "program" contribute to the success of our students, both before and after graduation.

POTENTIAL AUDIENCES

Related to the reasons for assessment, there are several potential audiences that can be targeted and/or that will benefit from a well-designed and regularly implemented program assessment system. Such audiences include (adapted from Apple and Krumsieg, 2001) the following:

1. students
2. all performers within the program
3. "sponsors" of the program (those who fund the program)
4. stakeholders, like alumni, parents, employers
5. granting organizations
6. accrediting organizations
7. those with political interests

THE PROCESS OF DEVELOPING A PROGRAM ASSESSMENT SYSTEM

There are four main components, or steps, to any assessment process (Apple and Krumsieg, 2001):

1. setting up the assessment (obtain shared purpose from assessee and assessor)
2. designing the assessment (establish important criteria, factors, and scales)
3. performing the assessment (collect and analyze quality data)
4. reporting the assessment (providing feedback in a constructive manner)

To date, we have completed the first two steps in our efforts to develop a program assessment system for the Ranger School, and we are currently implementing the third.

Two full days, one in January 2001 and one in September 2001, were formally set aside to set up and design the program assessment system. Education consultants from Pacific Crest, Inc. were employed to lead and facilitate each of the daylong sessions. The progress made during those two days we attributed largely to the expertise and objectivity of Pacific Crest's consultants.

Representatives from the faculty, staff, administration, and alumni participated in the design of the PAS as all were recognized as having critical influence over program quality. The latter group—which consisted of tenured and nontenured faculty, teaching assistants, secretaries, maintenance workers, kitchen workers, a department chair, the college president, and recent graduates—was divided into and worked as two teams. Working under very specific time constraints, each team was responsible for working through a 12-step methodology toward the development of a PAS applicable to the Ranger School program. This methodology is outlined and described in detail in Pacific Crest's *Program Assessment Handbook* (Apple and Krumsieg, 2001). Periodically throughout each day the teams came together to reflect on and synthesize their ideas and products.

EARLY RESULTS: THE RANGER SCHOOL PROGRAM ASSESSMENT SYSTEM

Due to time constraints, not all steps of the 12-step "methodology for producing a quality PAS" were completed. Results from the steps that were completed follow.

Mission Statement (Step 1)

The mission of the SUNY-ESF Ranger School is to develop leaders in the application of forest and surveying technology by providing highly respected educational programs and opportunities in a unique environment. This one-sentence statement captures the essence of the program and articulates the enduring mission of the Ranger School. This mission statement is, of course, related to, but more specialized than, the broad SUNY-ESF mission statement.

SUNY-ESF Ranger School's Program Goals for 2006 (Step 2)

The Ranger School faculty and staff identified 12 goals to pursue over the next five years. Those 12 goals are listed below:

1. annually produce 55 highly motivated, committed A.A.S. graduates in Forest Technology or Surveying Technology.
2. produce a summer bridge program for 25 students (e.g., advanced high school degree holder, first-year community college student in need of remediation, re-directed ESF student, career-changing degree holders) who need supplemental credits in preparation for the A.A.S. degree program.
3. have an established, effective Program Assessment System.
4. further develop a well-funded, attractive, high-quality, relevant, and affordable program.
5. foster a vibrant college community of competent, respected staff, faculty, and students.
6. have 5 working articulation agreements with four-year programs across different regions of the country.
7. have a working agreement with 5 colleges where their students can take our program as a component of their program at their college rate.
8. provide a plan for the support of applied forest research activities.
9. provide a plan to support community development activities.
10. provide the appropriate assistance in the development of an updated, "state-of-the-art" forest management plan for the James F. Dubuar Memorial Forest.
11. become a recognized leader in the continuing education of forest and survey technicians, related professionals and constituencies by providing conferences, workshops, and courses that don't exist.
12. earn ABET accreditation of the Surveying Technology curriculum.

Description of Key Processes Associated with the Program (Step 3)

The following processes were identified as helping to accomplish the goals listed in step 2:

1. There is an ongoing system for formative and summative assessments of instruction, student placement and development, client satisfaction, and goal development.
2. Planning, assigning responsibilities and resources, and assessing specific goals are delegated to appropriate faculty and staff members.
3. A dynamic and effective marketing and recruitment program exists that defines the product, the message, the clients, and the communication plan.
4. A strong development program exists that builds upon past efforts/processes to diversify participation and meet identified current and future needs.
5. Annually update each course's curriculum, its processes and student support services for producing excellent professional skills and ongoing well-being that meets the expectations of all clients.
6. Have in place an annual plan to enhance the quality and quantity of exposure and association with national professionals and modern technology to improve both educational and professional performances.
7. Provide community leadership to put in place a community development plan, which supports the health of the community and ultimately a positive environment for the faculty, staff, and students.

Assessment of the Current Program (Step 4)

Following the SII method of assessment (Apple and Krumsieg, 2001), several strengths of and several areas for improvement in the current program were identified. In addition, several insights (i.e., key discoveries and/or learning outcomes) were shared and recorded. It is important to note that this step, as with all others, was conducted by a diverse group of people who represented nearly all facets of the program. As such, this assessment was better directed and more valid than if it had been made by the faculty only, for example.

Create a "Standards Table" (Steps 5-10)

Steps 5-10 of the PAS development methodology involved defining and prioritizing "performance criteria" (i.e., focus areas of quality); identifying 1-3 "factors," or measurable characteristics, for each criterion; identifying "instruments" that existed or could be built to measure the factors; determining internal and external "standards"

for each criterion that could be used as a basis for evaluation; assigning accountability for each factor; and appropriately weighting each factor based on the contribution it makes to overall program quality. The results of completing steps 5-10 are incorporated into a “Standards Table” (Table 1).

Steps 11 and 12 in developing a PAS involve designing a process for continually assessing the program and the PAS itself. We have not formalized this process yet, but foresee opportunities to make faculty meetings, faculty retreats, annual reports, student surveys, advisory committee meetings, alumni surveys and interviews, and employer surveys a part of that process. In addition, we hope to have our PAS reviewed by the Society of American Foresters if and when they move to an outcomes-based assessment of forest technology programs.

Table 1. Standards Table for the SUNY-ESF Ranger School, September 2001.

Performance Criteria	Factor	Instrument	Linked Goals	External Standard	Internal Standard	Person Accountable	Weight
Desired Environment	Enrollment/ Graduation	Registrar	1, 2, 7, 10, 12	45	55	K.N.	22.5%
Diverse Curriculum	Placement	Questionnaire	3, 6, 12	85%	95%	K.N.	12.5%
Learning Laboratory	Managed Forest	Assessment Instrument for Management Plans	3, 4, 10	Good	Very Good	R.H.	10%
Desired Environment	Retention of Students	Registrar	4	85%	90%	C.L.W.	10%
Learning & Growth Environment	Student Performance Skills	Portfolio Skills Test	3, 10	Good	Very Good	J.M.S.	7.5%
Learning and Growth Environment	Professional Experience for Students	Log of Activities	3, 4, 8, 9, 10	20	40	M.R.B.	7.5%
Professional Staff	Collective Expertise	Vitae — summary tool	5, 8, 9, 10			C.L. W.	7.5%
Field Experience	Hours Logged	Log by Students	1, 4, 8, 9, 10	400	600	W.G.A.	7.5%
Professional Staff/Associates	Specialties	Annual Report	5, 10	25	50	W.B.	5%
Student Oriented	Student Satisfaction (weight accessibility heavily)	Survey	3, 5, 6, 7, 10	Good	Excellent	K.N./Class Advisor	5%

INSIGHTS AND BENEFITS RESULTING FROM THE DEVELOPMENT OF A PAS

The team approach used to develop our PAS fostered the development of a modernized and share sense of purpose and direction. It has, I think, united us and propelled us—the faculty, staff, and administration—toward a shared mission, shared goals, and a collective desire for quality. Equally important, the development of a PAS has provided the team with the means to measure and evaluate in the years ahead whether the increased program quality we seek is being achieved.

Other insights and benefits include

1. Outside consultants facilitated and ensured progress, and provided expertise to help clarify and/or answer questions.
2. Engaging in the process increased interaction and cooperation among faculty.
3. There now exists a more positive faculty attitude toward assessment.
4. There is greater use of teaching approaches that promote student involvement in learning (i.e., teaching is focused on learning outcomes and the production of high-quality graduates).
5. Our forest—our outdoor classroom—is a critically important resource: Our mission and nearly all of our performance criteria are linked directly to availability of a quality forest.

6. Applied research activities are supported and validated: Several of our performance criteria are linked to the goal of developing a research plan.
7. CE activities/events, although thought to be important, are not supported/validated by our current prioritized list of performance criteria.
8. The separation of PAS development workshops by 9 months, and the preparation and review of this paper by Ranger School faculty, constituted assessments of our PAS. These assessments have revealed to us that, while there are some refinements to make (e.g., in standards), our PAS is valid and on track.
9. Many of the instrument listed in the Standards Table we have used, currently use, and/or can develop relatively easily, we think.
10. There are selfish reasons for developing a PAS: We want to improve ourselves so that we can survive, excel, attract more students, and produce quality graduates that are ready and able to meet the challenges of their time. Enhancing student/graduate success is, arguably, an indirect, not a direct benefit of the PAS.
11. We need now to focus on student outcomes at the curriculum level and develop instruments that can be used to assess and/or evaluate those outcomes.

SUMMARY

In this paper I have defined what a program assessment system is, and have described the process that we followed at the SUNY-ESF Ranger School to develop one. Further, I have overviewed the current structure and content of the PAS developed for the Ranger School. Most importantly, I have shared with you some of the insights we gained and benefits we have already realized by engaging ourselves in the development of a PAS. We are hopeful that our new PAS will provide the type of data, information, and self-assessment that is needed to improve our program and, ultimately, the quality of our graduates.

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COMPARISON OF ACADEMIC STATISTICS OF TWO-YEAR COLLEGE TRANSFER AND NATIVE FISHERIES AND WILDLIFE STUDENTS AT THE UNIVERSITY OF MISSOURI

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ABSTRACT: As an increasing number of high school graduates take advantage of less-stringent economic and entrance requirements offered through two-year colleges, concern is mounting at the University of Missouri (MU) and other major universities about the ability of two-year college transfer students to compete in advanced, preprofessional curricula such as Fisheries and Wildlife. We assessed the validity of this concern by examining the academic histories of two-year college transfer students ($n = 21$), students transferring into our department from another MU program ($n = 23$), and students who had enrolled in Fisheries and Wildlife Sciences (FW) as freshmen ($n = 56$). Two-year college transfer students were less likely to complete the degree program in Fisheries and Wildlife than native students or transfer students from another department at MU. Students transferring to MU from two-year colleges had lower overall grade-point averages (GPA) at graduation and lower GPAs in advanced professional courses than native or other MU transfers. At graduation, both two-year college and MU transfers had taken substantially more credit hours than native FW students. For students wishing to complete a B.S. degree in Fisheries and Wildlife, the decision to begin their studies at two-year colleges might have academic and career costs; furthermore, anticipated reduction in economic costs may not be realized as hours required to graduate mount.

INTRODUCTION

In the Department of Fisheries and Wildlife Sciences at the University of Missouri (MU), the proportion of undergraduate majors who have transferred into the program from a two-year college has increased notably in recent years. In Missouri, high school students choose to begin their college experience at two-year institutions largely for two reasons: economics and academic qualifications. Tuition (per credit hour) is lower at two-year colleges than at MU; therefore students, and their parents, assume that the overall cost of higher education will be less if they enroll for the first 1-2 years at two-year colleges. Because MU has “selective” enrollment, based largely on ACT (or SAT) scores, not all students qualify for admission directly out of high school. However, if those students enroll for at least one semester at an accredited two-year college (usually with open enrollment) and earn passing grades, they may transfer to MU without limitation.

In 1993 the State of Missouri’s Outstanding Schools Act initiated the A+ Program, a school-improvement initiative designed to bring schools up to a higher standard and decrease the dropout rate. Students attending schools that meet “A+” standards who (1) maintain a 2.5 GPA; (2) have a 95% attendance record; (3) complete 50+ hours of unpaid tutoring or mentoring; (4) adhere to a no drugs and alcohol policy; and (5) maintain a 2.5 GPA at their chosen technical school or two-year college will be awarded two years of free tuition at those institutions. While the initial intent was to target schools and students who were at risk, the unintended effect is that highly qualified students are opting for the two-year college route because of perceived economic savings. Since 1997, more than 19,000 Missouri students have qualified for the A+ Program.

As the number of two-year college transfers to the Department of Fisheries and Wildlife Sciences at MU increased, we became increasingly concerned that students entering the program from two-year colleges might not be adequately prepared. As advisors and instructors, we observed anecdotal evidence that suggested these students showed weaker academic achievement (including academic dismissal or inability to compete for graduate

school opportunities) and/or required more time to complete the B.S. degree, thus negating the economic benefits of beginning at a two-year institution.

To quantify these concerns we examined the academic records of all students enrolled in our program since 1999 to assess their graduation rate, their overall performance (GPA at graduation), the likelihood of academic probation or suspension, their academic performance in advanced, professional courses, and total credits at graduation.

METHODS

We assessed the academic histories of two-year college transfer students ($n = 21$), students transferring into our department from another MU program ($n = 23$), and students who had enrolled in Fisheries and Wildlife Sciences (FW) as freshmen ($n = 56$). We recorded whether each student graduated, the number of transfer credits, the number of years at MU, the cumulative grade-point average (GPA) at graduation (for two-year college transfers, GPAs reflect only grades at MU), total number of college credits, and the GPA in advanced, professional concentration courses. Professional concentration courses included general ecology and animal population dynamics (required of all our majors), and 6 courses from among the following: mammalogy, ornithology, wildlife techniques, wildlife conservation, urban wildlife management, waterfowl biology and management, limnology, ichthyology, fishery techniques, fisheries management, and water quality.

RESULTS

Although two-year college transfers completed a mean of 60 credit hours prior to enrolling in our program (Figure 1), a majority of them did not complete an Associate's degree. A cursory examination of their transfer credits suggests that many did not select courses at the two-year institution solely with the purpose of meeting the requirements of our program. Most two-year transfers took courses that would not replace required General Education or Departmental Major requirements.

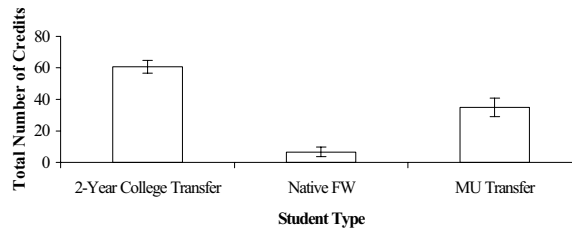


Figure 1. Mean number of credits transferred into the Department of Fisheries and Wildlife Sciences Department from students who were transfers from two-year colleges, freshmen enrollees (native FW), and transfer students from within MU. Small number of credits for native students are due to college credits earned while attending high school.

Freshmen enrollees in FW completed their 125-hour degree requirements in an average of about 4.5 years, whereas two-year college transfers required between 5.5 and 6 years (including the 2+ years prior to enrolling at MU), and MU transfers took over 6 years to graduate (Figure 2). MU freshmen enrollees graduated with GPAs just below 3.0, significantly higher than that of two-year (~2.4) or MU transfer (~2.7) students (Figure 3). Grade trends in advanced, professional courses were almost identical to overall GPAs for each student category (Figure 4).

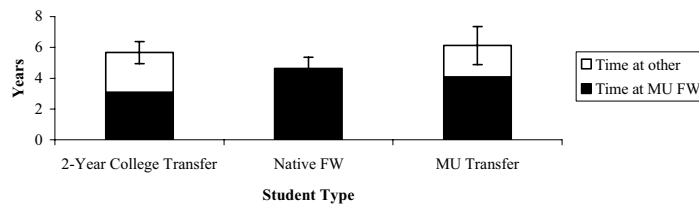


Figure 2. Mean number of years to graduation for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees (native FW), and transfer students from within MU.

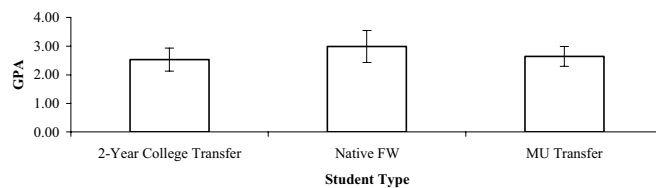


Figure 3. Grade-point averages (GPAs), at graduation, for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

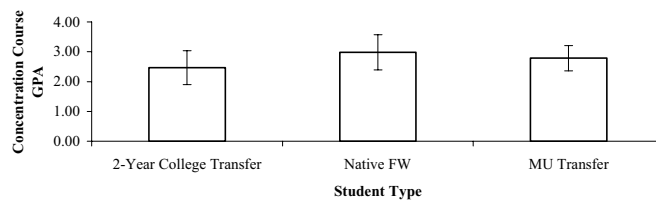


Figure 4. Grade-point averages (GPAs) in advanced, professional concentration courses for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

Only about 50% of two-year college transfers graduated with a degree in Fisheries and Wildlife, whereas the graduation rate for freshmen enrollees and MU transfers was between 60% and 65% (Figure 5). Those transfer students from two-year colleges or from MU, who completed their degrees, did so with a mean of approximately 150 total credits (125 minimum-credit requirement in FW) (Figure 6). Freshmen enrollees had a mean of just over 130 credits at graduation. Approximately 65% of two-year transfer students were placed on probation or suspended at some point in their careers at MU and slightly more than 30% were eventually dismissed from the university for academic reasons (Figures 5 and 7).

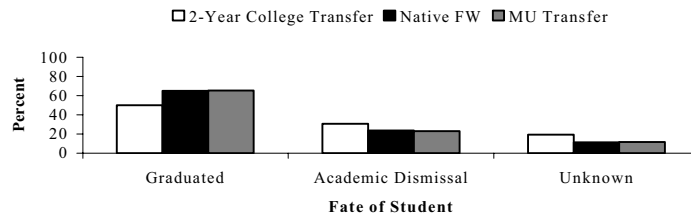


Figure 5. Academic fates of Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

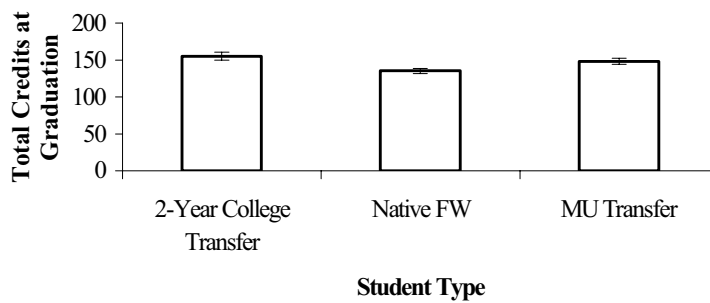


Figure 6. Total credits earned at graduation for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

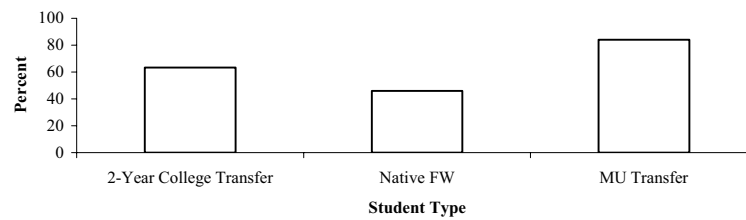


Figure 7. Percent of students placed on academic probation or suspension for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

A higher proportion of MU transfers to our program had been placed on probation or suspended (over 80%), but only about 20% were dismissed (Figures 5 and 7). Most of the MU transfer students had been placed on probation prior to transferring into Fisheries and Wildlife. Approximately 45% of freshmen enrollees in FW received probation or suspension actions and about 20% were dismissed from the university (Figures 5 and 7). Because a graduate degree is widely regarded as the entry-level *professional* degree in Fisheries and Wildlife disciplines, and a 3.0 GPA is usually a minimum qualification for entry into a graduate program, we examined the proportion of our majors who earned at least a 3.0 at graduation. Approximately 50% of students who enrolled as freshmen in FW graduated with a 3.0 GPA, whereas only 15% (two-year) to 20% (MU) of transfer students earned a 3.0 GPA (Figure 8).

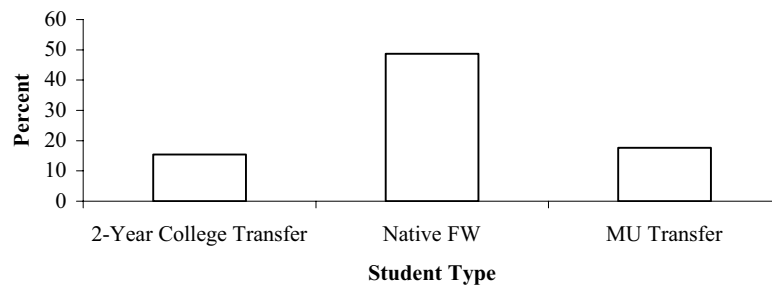


Figure 8. Percent of graduates earning at least a 3.0 grade-point average for Fisheries and Wildlife Sciences majors at the University of Missouri (MU) who were transfers from two-year colleges, freshmen enrollees, and transfer students from within MU.

DISCUSSION

Students who begin their academic careers at two-year institutions are at much greater risk of being dismissed and earning GPAs below 3.0 than freshmen enrollees in FW. Several factors may contribute to this situation. One possibility is that students who fail to qualify for entry into MU as freshmen do not improve their chances by taking a series of courses at a two-year college. It is likely that many have ACT scores substantially lower than freshmen enrollees at MU, as well as lower high school class rankings, the two standards used to determine qualification at MU. Another possibility is that the series of courses they choose to take do not academically prepare them for the level of coursework they face at MU. Workload expectations at MU also may exceed those of two-year colleges. Some students, academically successful at two-year colleges, may not be prepared for the greater academic expectations at MU.

Beyond academics and economics, personal/social factors may affect high school students' decisions to attend two-year colleges. Students from smaller or rural high schools may choose to avoid the large campus atmosphere at MU. Other students may simply wish to stay closer to home and families. These issues may still be operative when those individuals later transfer to MU (i.e., taking classes at a two-year college may not affect eventual socialization at MU). Any sense of social discomfort at MU may affect academic performances.

Unless students choosing two-year college pathways have already decided on their eventual major at MU, carefully selected courses to meet curriculum, and prepared themselves for a large campus experience (potentially farther from home), they may not realize economic savings. Many students assume that if they arrive at MU with 60 hours of credits, they only need 65 additional hours to graduate. Unfortunately that is rarely the case. Our data indicate that two-year college transfers into FW spend from 3-3.5 semesters at MU (versus 4.5 for freshmen enrollees). The cost of those 3-3.5 semesters at MU, plus the approximately 2 years at a two-year college would almost always exceed the cost of having enrolled at MU as a freshman.

Students who are academically qualified and reasonably sure of their interest in a FW degree would be better off enrolling as freshmen at MU. This would be particularly true for those students with strong, professional career interests in Fisheries and Wildlife. When economics makes this choice impossible, better communication between the four-year and two-year institutions is necessary to make the transition as efficient as possible.

USING THE FOREST VEGETATION SIMULATOR AS A TEACHING TOOL

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ABSTRACT: The Forest Vegetation Simulator (FVS) is a tree-level, spatially non-explicit growth model. It is an outgrowth of the Stand Prognosis model that the U.S. Forest Service began developing in the late 1960s. Local variants of FVS now cover most of the forest types of the United States. Development of two complementary programs, Suppose and the Stand Visualization System (SVS), have opened the possibilities for using FVS as a teaching tool in forestry classes. Suppose provides a graphical user interface that eliminates the need for writing command line-level simulation scripts; SVS enables realistic visualization of stand structure and composition at any period in a simulation. Since 1995 we have used FVS to demonstrate silvicultural systems and provide hands-on practice in undergraduate silviculture courses. Modules for use in forest economics, forest pathology, and landowner education are under development. In early 2000, we developed Web-based lessons to complement a two-week silviculture laboratory module on FVS, Suppose, and SVS. The Web-based lessons save instruction time previously spent on orientation to the software and allow coverage of a greater range of topics during the two-week module than in previous years. The Web site has been expanded to include hyper-linked versions of the FVS keyword manual and USFS exercise manuals, and silviculture examples from a wide variety of forest cover types. This workshop will introduce instructors to the capabilities of FVS, Suppose, and SVS. Topics covered will include Web resources, data entry and organization, use of selected simulation keywords, visualization of results, and exporting text and graphics for use in other programs. Each participant will receive a CD-ROM that includes all programs necessary to run simulations with their own data.

STRUCTURED EDUCATIONAL DESIGN WORKSHOP

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ABSTRACT: Effective educational design occurs when there is congruity between four components of the educational system: (a) the educational outcomes sought, (b) the educational program, (c) the student, and (d) the teacher. This workshop will engage up to 20 participants to help them take a structured approach to designing individual courses and streams of courses to achieve given educational goals for specific groups of students. Participants will be guided through an adaptive management process that leads to progressive improvement of educational designs. The session will start with a brief presentation of the educational design model that underpins this workshop, describing each of the four elements listed above and their relationships. Participants will then work in groups to: (1) Write specific, observable learning outcomes, starting with the general outcome descriptions listed in the new SAF accreditation guidelines; (2) Identify courses in their own institution's programs in which the outcomes identified in (1) could be learned or assessed; (3) Using tools and approaches described by the workshop leaders, develop learning and assessment activities that would fit into the courses identified in (2) to achieve the outcomes identified. The leaders will then make a short presentation and question/answer session on their own experience with this approach and some of the strategies that have proven effective for continuously and systematically improving courses designed in this way. The workshop will end with a facilitated discussion among the group of how to implement this approach in their own courses, what pitfalls they anticipate, etc.

INTEGRATING SPATIAL INFORMATION TECHNOLOGIES INTO NATURAL RESOURCES CURRICULA

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ABSTRACT: Spatial information technologies increasingly are used in forestry and natural resources management and research. Our long-term goal is to provide students with hands-on exposure to these technologies from the moment they enter their undergraduate natural resource curricula until they graduate, by integrating spatial information technology into a number of key courses. We have designed a prototype laboratory sequence in which students use geographic information systems, global positioning systems, and statistical sampling techniques in an integrated process to estimate forest basal area. Participants in this workshop will experience our approach from the students' perspectives. We will present our rationale for each step in the sequence and discuss with participants methods for improving and extending the concept. Workshop participants will have half of the time for hands-on activities interspersed with discussion. Participants will be invited to discuss and/or demonstrate activities that they have used in their classes.

INTRODUCING PROBLEM-BASED LEARNING TECHNIQUES INTO THE NATURAL RESOURCE MANAGEMENT CURRICULUM AT THE UNIVERSITY OF DELAWARE

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ABSTRACT: Natural Resource Management is a relatively new interdisciplinary major in the College of Agriculture and Natural Resources at the University of Delaware. This paper describes the efforts of faculty to incorporate problem-based learning techniques into several courses in the Natural Resource Management major. It includes a brief history of the major; an overview of problem-based learning programs and initiatives at the University of Delaware; a discussion of problem-based learning techniques recently introduced into courses in statistics, community economic development, environmental law, and a senior capstone course; and observations by faculty and students on the problems and benefits of problem-based learning techniques.

INTRODUCTION

Natural Resource Management (NRM) is a relatively new interdisciplinary major in the College of Agriculture and Natural Resources at the University of Delaware. The major is co-sponsored by three Departments within the College: Entomology and Applied Ecology, Food and Resource Economics, and Plant and Soil Sciences. The program has attracted very high-quality students both as freshmen and transfers from other majors within the university. In response to increased awareness of the benefits of problem-based learning techniques, many

faculty have incorporated problem-based learning techniques into several required and optional courses in the NRM major.

BRIEF HISTORY OF THE NRM MAJOR

The College of Agriculture and Natural Resources at the University of Delaware offers a variety of traditional, discipline-specific undergraduate majors in five academic departments. Beginning in 1994, a faculty committee worked for more than two years to formulate a new interdisciplinary major. The first freshmen students were admitted to the NRM major in the fall of 1997 (Hastings and Anuinas, 1998).

The need for the new major arose from two sources. First, a need to coordinate existing course offerings in the college into an interdisciplinary major that transcended traditional departmental majors (e.g., Wildlife Conservation, Environmental Soils Science, and Agricultural Economics). Second, the college had many requests from prospective students for a major focused on natural resources and the environment. These requests originated from an incorporation of environmental topics into high school biology, chemistry, and agriculture curricula, as well as intensifying local and global issues focusing on the environment

NRM was designed to fill the void for students who sought to have a solid training in the physical sciences but also have an understanding of economics, ethics, and public policy. As articulated by the faculty committee that formulated the major, the purpose of the curriculum was to produce graduates with: (1) an understanding of the social, physical, economic, legal, and political problems of managing the use and perpetuation of natural resources in the twenty-first century and (2) the skills and capabilities to address those problems in both public or private forums.

The curriculum was designed to ensure that characteristics of graduates would include

- the skills required to solve "real-world" problems;
- the ability to write and speak effectively;
- a solid understanding of natural sciences, mathematics, statistics, economics, and public policy;
- a sound knowledge of the world's biodiversity;
- a competence in using computers to manage information and solve problems;
- a broad interdisciplinary education in the arts, humanities, and social sciences; and
- an awareness of the ethical issues in natural resource use and management.

The curriculum relies heavily on courses already offered by the sponsoring departments within the college, (Entomology and Applied Ecology, Food and Resource Economics, and Plant and Soil Sciences), together with courses offered in other colleges across the university.

In the Spring 2002 semester, NRM has 28 majors. Many have done internships with a variety of state and local agencies including the Delaware Water Resources Center, the Delaware Water Resources Agency, the Delaware Emergency Management Agency, the U. S. Army Corps of Engineers, and the Delaware Nature Society. Thus far, the program has produced 14 graduates; seven more will graduate in May 2002. The graduates have been successful in finding jobs in both the private and public sectors as well as attending graduate and law school. Employers of recent graduate are Clayton Group Services (national environmental consulting firm), Environmental Alliance (regional consulting firm), Maryland Environmental Services, the Kent County (Delaware) Conservation District, Horne Engineering Services, and the Department of Natural Resources and Environmental Control (Delaware).

PROBLEM-BASED LEARNING INITIATIVES AT THE UNIVERSITY OF DELAWARE

The introduction of problem-based learning into courses and curricula at the University of Delaware began in 1992 (Duch et al., 2001). Since then, the University of Delaware has become a national and international leader

in the use, training, and development of problem-based learning. Dr. George H. Watson, Professor of Physics and Astronomy, and a leader of campus problem-based learning activities, summarized (via e-mail, January 2002) recent and future activities at the university as follows:

- training faculty in active learning and instructional technology via the Institute for Transforming Undergraduate Education (ITUE), week-long faculty training sessions which began in 1997;
- received funding from both the National Science Foundation and the Pew Charitable Trusts to support problem-based learning education and development;
- developed (and hosting) the Problem-Based Learning Clearinghouse, a peer-reviewed online repository of problem-based learning problems;
- in 2001, offered a bilingual ITUE session for a group of visiting engineering deans from France; and
- in June 2002, will be hosting PBL 2002: “A Pathway to Better Learning,” an international conference on problem-based learning.

PROBLEM-BASED LEARNING IN THE NRM CURRICULUM

Duch et al. (2001), citing Boud and Feletti, outline the problem-based learning process as follows: Students are presented with a problem; working in groups the students identify “learning issues” or aspects of the problem they do not understand; issues are ranked and assigned to be investigated by the group or individually; and, then, the issues are explored and new learning issues developed as the process continues. While numerous operational models exist for this process, most include a problem to be solved/explored, students working in groups, independent exploration by the students, and discussion and/or presentation of findings.

At the University of Delaware, faculty use a variety of problem-based learning techniques in a variety of courses. A text by Duch et al. (2001) provides eleven case studies of different faculty’s problem-based learning experiences in subject-matter areas ranging from agriculture to physics. Some use problem-based learning exclusively; other mix problem-based learning techniques and more traditional lecture-based approaches.

Several faculty that teach required and recommended courses in the NRM major have incorporated problem-based learning approaches into their courses. The following sections describe the approaches used, and student and faculty reactions to them.

FREC 408: “Research Methods I”

FREC 408: “Research Methods I” is designed for juniors and seniors, within the College of Agricultural Sciences and Natural Resources, to provide skills and insight into research methodologies. FREC 408 emphasizes elementary statistics from description of data through an introduction to regression. It generally has an enrollment of 50 students from a diverse set of majors (Animal Science, Agribusiness, Plant Sciences, Natural Resources, Wildlife Conservation, and Entomology). FREC 408 is considered a substitute for a statistics course for these majors and is generally viewed as a requirement of the majors. The course is designed to give the students an appreciation and understanding of the use of descriptive and inferential statistics in the agricultural sciences. The course does not assume that the students have any prior exposure to statistics. Students use spreadsheets and hand calculations to apply statistical techniques to real data.

FREC 408 has historically been taught with elements of problem solving and student projects. However, it was primarily a lecture-based course with students working individually on assignments. In Fall 2000, the structure of FREC 408 was revised to incorporate key components of problem-based learning. Nine group assignments were introduced into the course. One, of three, classes per week, students were assigned one or two problems that reflected course material and were given class time to complete the assignments. The instructor and a graduate student circulated among the groups to answer questions and assist students as they worked. This format

allowed for students to work through statistical applications with the support of their fellow group members. Students signed an answer sheet and turned in their results.

The group assignments were designed to push the students beyond the lecture material. They use interesting examples to demonstrate techniques and strategies of statistical analysis in an interesting format. Answers to the problems were provided via the Web site and at times in the next class.

At the end of the class, students completed a short evaluation that addressed the modifications of the course. The first part of the evaluation used a five-item scale: 1 (Very Useful), 2 (Useful), 3 (Slightly Useful), 4 (Not Useful), 5 (Not at All Useful). Of the 52 students in the class, 44 voluntarily completed the evaluation form (85% response rate).

Students responded positively about the changes to the class. The group assignments were rated as Very Useful or Useful by more than 80% of the students. Over half rated the group assignments as Very Useful. A follow-up question focused on the effectiveness of the group assignments in helping the student understand the material. On a scale from 1-10 (with 10 being Very Effective), the average rating was 7.7 (the median and mode were 8). Only one student gave a rating of one, while nearly 2/3 (63.6%) gave a rating of 8 or higher.

Overall, the use of group assignments in FREC 408 was beneficial. The assignments broke up the monotony of lectures; provided useful exercises to challenge the students; and gave the students an opportunity to work together on problems. As an active participant in the group exercises, the instructor gained a sense of what material needed to be reviewed or emphasized.

No problems were experienced with the make-up of groups or group dynamics. Students did not have to meet or work on the group assignments outside of class. Managing assignments outside of class would have posed more group-dynamic problems. Grading issues were avoided by giving each group all the points for the exercise provided that they were present and completed the work.

There were several “lessons learned” about the use of group work. First, allow enough time to complete the exercises. Second, the group work must be balanced and coordinated with the class lectures. Third, it is important for the instructor and a graduate student to serve as a resource for the groups. Finally, many students wanted to see the correct answer to the problem—post the answers at the end of the exercise or provide the answers on a Web page.

FREC 429: “Community Economic Development”

FREC 429 is not a required course for any major in the department. It is a group option—offering breadth—for majors in Natural Resource Management and Resource Economics. The course objectives are to introduce students to the practice and principles of community economic development in the United States, and to enhance students’ ability to recognize, understand and respond to local, regional, and national economic development issues. Students are exposed to course topics via mini-lectures by the instructor and presentations by other students. Each student is required to read, outline, and present articles from the reading list to the class as a whole.

In addition to individual assignments and exams, major components of the course are two group assignments. For these assignments, teams of 3-4 students are required to function as “economic consultants.” Each team selects (adopts) a county of their choice and is asked to address various economic growth and development issues about the county. Teams organize themselves and assign roles (recorder, task master, etc.) and responsibilities for each of the projects. Students are led through the process of conducting an economic study of their county that includes identifying socioeconomic conditions; identifying an economic issue and how economic theory can contribute to the solution of the issue, applying appropriate analytical techniques and possible policy remedies.

Class time is a must for team discussions, review of work, and assignment of responsibilities. Team reports are presented in a written format and are also presented to the class. Most teams use presentation software and prepare very impressive presentations. For credit, students are asked to specify their role on the team and the extent of their contribution to the report. They also rate other team members' contributions to the project.

In formal course evaluations, student commented that the strengths of the course included the group work and that the course material was applicable to the "real world." They thought that they could apply what they learned in class to local development issues. Overall, it is clear that students enjoy the team approach to address current economic development issues.

From the instructor's perspective, there are several "operational" issues with this approach to the course. One is unequal effort by team members. In some instances, the team members regulate this internally. In some cases, the instructor must intervene. In small classes, it is obvious which students are not participating fully, and if not, other team members will gladly tell you. A second issue is class time allocated to teamwork. If you have used the traditional lecture format, it is difficult initially to relinquish "lecture" time for teamwork. It is naïve, however, to think that team members will find time outside of class to meet on a regular basis. A final, and perhaps the most difficult, issue is assigning credit and grades for team activities.

FREC 450: "Topics in Environmental Law"

The problem-based learning component of the undergraduate seminar, FREC 480: "Topics in Environmental Law," has been increasing since 1998. The course is taught yearly to fifteen to twenty students. The syllabus acts as an extensive course contract, specifying expectations about student effort, active-learning exercises, and group activities. Students are divided into five permanent groups on the first day of class, and each class meeting involves active-learning exercises such as 50-minute problems, role-playing advocacy, group reflection, and peer review. Content objectives center on learning the institutions and processes of environmental conflict resolution in the United States. As important, however, is the course objective to improve the analytical skills of the students. To achieve the latter objective, the course has been redesigned to include a semester-long problem focusing on student analysis and the assimilation of peer and instructor reviews.

Students select an actual environmental conflict to study at the beginning of the semester by searching Lexis-Nexis, using topics of interest to them. The problem then is to identify the fundamental conflict of interests among stakeholders and to assess the relative performance of conflict-resolution processes. Although ultimate student achievement has generally been outstanding in the past, a great deal of resistance (or lack of confidence) from students remained because of the burdens of what was seen as a 25-page research paper. To attenuate this resistance, the active-learning components of this problem were emphasized by the construction of a Web-based interface for peer review.

The interface was designed so students could submit six assignments using a Web-based form over the course of a semester. These assignments, collectively, constitute the semester-long paper. Using the Web, however, the assignments are available to all students for peer review. Group members are required to review four of the six assignments of their peers and submit at least three substantive comments for each using the Web interface. In total, each student posts six assignments on the Web and receives four Web-based critiques from each group member. The instructor also graded and commented on each assignment. At the end of the semester, a revision of the problem is due, which requires students to assimilate between 14 and 18 separate documents of peer and instructor feedback. The technological challenges in designing and maintaining a secure, private interface were substantial (see Duke and Whisler, 2002).

Student comments were positive about the problem-based learning modifications. The comments included the following: "the individual project spanning the semester was very useful"; "the Web site aspect of the course was useful"; "I really enjoyed the class; I definitely have a new view and way of thinking about environmental problems."

The effect of the problem-based learning activities on student learning was positive. The student groups functioned well, and the students treated one another with respect. The class had few disruptions, and the students were consistently engaged. The Web-based interface encouraged the students to complete much more work out of the classroom. In addition, students tended to take more ownership of their projects, improved their level of argumentation, and seemed more accountable for the quality of their work. These quality improvements are likely due to the effect of peer pressure; when all of the students' problem analyses and peer reviews are posted for all the class to see, the incentive to produce a higher-quality product is quite strong. The students actively collaborated in discussing and solving difficulties they were having in completing their problems. A shortcoming of the problem-based learning revision is that the group structure created a vehicle for organized dissent during the particularly difficult times during the semester. Overall, however, the instructor believes the students learned more, spent more time learning, enjoyed class more, and produced higher-quality projects. The higher-quality work was especially evident among the lower-performing students.

ENTO 467: "Capstone: Interdisciplinary Natural Resource Management"

This course was developed to be an interdisciplinary capstone course for Wildlife Conservation, Natural Resources Management, and Environmental Soil Science majors in the College of Agriculture and Natural Resources. Prior to this initiative, no capstone course existed for these majors. The course materials were developed during the Summer and Fall 2000 and the course was offered in Spring. Eight students (WC and NRM majors) enrolled in the course and completed all the requirements.

The course was designed to be a problem-based learning experience. Course content focused on an interdisciplinary approach to examining the White Clay Creek Watershed with special emphasis on the White Clay Preserve (PA), White Clay Creek State Park (DE), and the collaborative effort that led to the watershed being designated a Wild and Scenic River.

The instructor and other experts introduced issues and assignments via mini-lectures. The course involved a mix of group and individual assignments. Course materials were provided in both printed and Web format. Students presented individual and group assignments to the class. The three major assignments focused on (1) biodiversity in the White Clay Creek Watershed, (2) water resources of the White Clay Creek Watershed, and (3) legal protection of the resources of the White Clay Creek Watershed. The theme of all the assignments was using collaboration to solve natural resource management problems. Students used the course text, a variety of government reports and studies, and numerous Web resources to complete the assignments.

Students gained skill in finding relevant resources for problems, sharpened group-activity skills, and improved oral/written communications using "real-world" problems. The focus was on collaboration and providing students with opportunities to practice critical thinking and improve problem-solving skills.

Two evaluations of the course were conducted during the last week of class. One focused on the problem-based learning components of the course. The students found the group assignments, individual assignments, and guest speakers to be very useful aspects of the course. Reactions were more mixed to the readings and the text. The group work was deemed to be very effective (8.65 on a 10-point scale) in helping understand the course material. Aspects of the group work that students liked best were dividing up work and hearing alternative ideas and views. The aspect liked least was finding time to meet outside of class (students were actually given ample time in class to do assignments).

All three of the group assignments in the class involved the White Clay Creek Watershed. Students thought three assignments were appropriate. In retrospect, it might have been better to vary the topics. This was supported by 87% of the students. Overall, the students had positive comments about the course. The small class size was noted as a plus. A suggestion to be considered for the future was a field trip.

In addition to the problem-based learning survey, the regular College of Agriculture and Natural Resources course evaluation was conducted. Overall, the comments about the course and instructor were positive. The students commented that the strengths of the course were “teamwork,” “real-life problems,” and applying what they had learned.

SUMMARY

Since 1992, the University of Delaware has evolved into a national and international leader in the use, training, and development of problem-based learning. Natural Resource Management is a relatively new interdisciplinary major at the university. In response to increased awareness of the benefits of problem-based learning techniques, many faculty who teach required and optional courses in the NRM major have incorporated problem-based learning techniques into their courses. Collectively, the changes are viewed as positive by both the students and the instructors. The changes have added new dimensions to students’ learning processes. The use of these problem-based learning techniques helps produce NRM graduates with many desired skills, including the ability to solve “real-world” problems, the ability to write and speak effectively, the use of technology to manage information, and an interdisciplinary understanding of the world around them.

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TWO BIRDS, ONE STONE: CAN A NATURAL RESOURCES “CORE” CLASS SERVE THE ENTIRE UNIVERSITY?

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ABSTRACT: As natural resource management grows more complex, natural resource curricula continually must expand to incorporate new topics and techniques. At the same time, colleges and departments are pressured to keep within tight budgets, and to meet the demands of students, parents and legislators to minimize the length of time needed to acquire a degree. In the College of Natural Resources (CNR) at Utah State University (USU), one strategy for achieving these apparently conflicting needs has been to create “core” courses that can serve students in all CNR majors, thereby reducing the potential for overlap and redundancy. When the university

switched in 1998 from a quarter to a semester calendar, the college was challenged to maintain a core while reducing the number of required credits, continuing to meet professional accreditation standards, and participating in an expanded university-wide general education program. One way we tried to meet that challenge was to develop a new core course called “Natural Resources and Society” that would simultaneously: (1) meet the core goal of introducing majors to the human dimensions of natural resources; (2) meet the general education goal of providing a broad introduction to the ideas and methods of the social sciences; (3) attract large numbers of non-CNR students (important because some university funding is tied to student credit hours); and (4) recruit students into the university’s lowest-enrollment college. This paper describes our evaluation of the course’s success at meeting those objectives.

“Natural Resources and Society” introduces students to some of the concepts and methods of sociology, psychology, anthropology, and political science; traces society/nature relationships in North America from prehistory to the present day; and offers an introduction to the human dimensions of natural resources from a variety of disciplinary perspectives. (For example, psychology provides insights on why scenic quality is important; sociology can explain how social institutions evolve as a response to the needs of natural resource occupations; and so on.) Enrollments have grown from an initial 92 students in Fall 1998 to 258 in Fall 2001, including 62 CNR majors, 30 non-majors who wanted a course focusing on the relationships between nature and society, and 166 students who wanted a required general-education social science class at a convenient time of day. The course is taught primarily in a large lecture format; requires students to complete three multiple-choice exams, several writing assignments, and a group project; and is supported by a teaching assistant and a course Web site. About five students per term are recruited into CNR majors—not insignificant in a college with slightly more than 300 undergraduates. The university provost’s office has praised the course as a model for how concepts from multiple disciplines can be integrated into a single lower-division course by means of a common theme.

To evaluate success we re-entered data from the standard university course evaluation forms completed in Fall 2000 (N=155) into the SPSS statistical package. We performed chi-square analyses to test for significant differences between CNR majors (39% of respondents) and non-majors, and between freshman (42% of respondents) and upperclassmen. We also coded student comments using qualitative social science methods.

Mean course and teacher evaluations were at or slightly above the university’s general education median. However, mean overall course evaluations by majors were 0.8 higher (on a 6-point scale) than those given by non-majors. Overall instructor effectiveness ratings were 0.7 higher by majors. Both findings are significant at the $p < .001$ level. Overall course evaluations were 0.7 higher from upperclassmen than from freshmen, and overall instructor evaluations were 0.6 higher for upperclassmen than from freshmen (both $p < .001$). No correlation was found between evaluation scores and anticipated course grade or cumulative grade-point average. Freshmen respondents were significantly more likely to be non-majors.

Qualitative evaluation of comments found that the best-liked features of the course were the Web site (especially online availability of class notes) and the instructor’s enthusiasm and apparent knowledge of the topic. The most frequent criticism of course content by non-majors was that there was too much natural resources and not enough social systems and issues; the most frequent criticism of content by majors was that there was not enough natural resource management and too much social science. Criticisms by freshmen and non-majors of the course’s delivery were most frequently about the readings, which they found irrelevant to their interests and difficult to understand. Majors’ criticisms of course delivery were most often about the group project: They found it hard to contact other members, and felt they had to shoulder a disproportionate share of the workload. Majors also criticized the large class size, which is highly atypical for CNR courses.

We conclude that CNR majors who enroll in “Natural Resources and Society” are getting a better course than non-majors. However, the need to serve non-major freshmen probably holds back majors, while freshmen may not be ready to cope with the high levels of ambiguity of some concepts. Non-majors probably would be better served by a more wide-ranging theme than natural resources. The instructor feels he is not well served because the evaluations are considerably lower than he is used to seeing.

So is the experiment a success? It depends on one's perspective. The course succeeds for the university because it offers thematic integration of key subjects in a class that gets acceptable evaluations. It succeeds for the College of Natural Resources because it generates student credit hours, recruits a few students each term, and has provided a way for CNR students to achieve general education and core goals in one 3-credit class. However, the teaching and learning experiences are likely to be better if the courses were separated; which is precisely what will happen—not because the experiment is judged a failure, but because the provost's office has decided to discourage “double-counting” classes as general education and major courses because it violates the spirit of the general education program. As a result, “Natural Resources and Society” is being redesigned for majors only. It is not yet known (as of Spring 2002) whether the college will be able to continue participating in the university's general education program to the same extent as before.

TEACHING TO LEARN AND LEARNING TO TEACH: A CASE STUDY OF MULTILEVEL, INTERDISCIPLINARY EDUCATION IN NATURAL RESOURCES

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ABSTRACT: The University of Vermont's School of Natural Resources (SNR) has linked undergraduate and graduate education through a recent update of a sophomore-level class in SNR's core curriculum: “Environmental Problem Analysis” (NR105). As a result of a series of collaborative workshops, NR105 now includes explicit links to two other courses: “Ecology, Ecosystems and Environment” (NR103) and “Social Processes and the Environment” (NR104), and students must take these three courses concurrently. NR105, a multidisciplinary, integrative course, is taught collaboratively by two SNR Ph.D. students (an ecologist and a social scientist), and fulfills their graduate teaching requirement. Through direct course development and oversight, regular meetings with faculty members who teach the concurrent courses, and participation as members of the core faculty development group, this model places Ph.D. students into a “faculty apprentice” role. The three-course sequence thus combines integrative, cross-disciplinary education with a multilevel approach to education. At both undergraduate and graduate levels, it also includes an explicit focus on group work and interdisciplinary team collaborations.

Current work is designed to sustain and build upon the recent curricular revision; we are developing and implementing an interdisciplinary, conceptually linked Web site for the three-course program. Although still in progress, the homepage of this Web site is available at <snr.uvm.edu/core>. The individual class Web sites for the sophomore-level courses utilize a common format, and include links to Web-based resources that are not course-specific. These resources can be used, not only by currently enrolled undergraduates, but also by course instructors. Future work may include further Website development to utilize a common format and resources for all courses in SNR's core curriculum.

This project has linked three concurrent sophomore-level classes in the undergraduate core curriculum in SNR. It has linked undergraduate learning of integration across disciplines, with an enhanced understanding of integration for the Ph.D. student instructors of this course. It has introduced group skills to the undergraduates, and deepened interdisciplinary collaboration skills in the Ph.D. student instructors. The project is also increasing the use of technology within SNR's core curriculum, and encouraging a smooth transition to subsequent Ph.D. student instructors of NR105 through peer mentorship. It is also being used as a possible model for further curricular reform within SNR and elsewhere at the University of Vermont.

THE I'S AND E'S OF NATURAL RESOURCES EDUCATION, OR, MOVING FROM LEARNER TO TEACHER

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ABSTRACT: Natural resources provide some of the most fertile and interesting subjects for an educator to present. Yet, our undergraduate and graduate students are poorly prepared to be educators. Few Master's or Doctoral programs require any education courses before a degree is bestowed. We touch hundreds of students each year in our classes who will become professionals, but are we giving them the tools to pass on their love of the resource to the next generation? Undergraduates and graduate students who are taking our courses should, in my opinion, have the skills and more importantly the desire to pass on the knowledge we impart. Therefore, I believe we need to think about putting the I's and E's into our teaching so at least, when our students are *Imitating* their professors, the models will be beneficial and positive. We should *Exemplify* the best we can be. We want students to *Emulate* our good *Examples*. I am suggesting that you try this *Invigorating* way of teaching so at the end of the semester everyone in class will move further along a continuum from learner to teacher.

INTRODUCTION

Natural resources provide some of the most fertile and interesting subjects for an educator to present, particularly at the college and university level. For example, bird watching and wildlife photography are two of the fastest-rising outdoor recreational pursuits in the nation. There are hundreds of wildlife-related programs on television and all seem to be gaining increasing audience shares. Almost everyone has an interest and questions about some aspect of natural resources. Those of us here have the opportunity to teach future professionals about our passion. However, are we giving them the tools to pass this passion on to future generations? We teach some of our education-oriented students the skills they need to be teachers, but are we missing the chance to influence the larger cohort. Are you instilling the excitement of sharing and educating in all of your students?

Few Master's or Doctoral programs require any education courses before a degree is bestowed, and many Ph.D.s move directly into research, teaching, and extension positions: all of which require a strong element of teaching, for which they receive little formal preparation. For the most part, it seems that these new, young professionals, thrown into the arena of education, parrot what they have enjoyed or endured from their professors. It has made for some outstanding educators, and for some that are skewed at the other end of the distribution curve. However, this process is changing for the better in some program, but merits our attention.

Undergraduates and graduates students who are taking our courses for a requirement, an elective, or just for enjoyment should, in my opinion, have the skills and, more importantly, the desire to pass on the knowledge we impart. Whether they are practicing natural resource professionals or just enjoying the resources they work so hard to conserve, they will find curious people. The public's questions come from a genuine interest in what students and professors do and the flora and fauna we work with. Many of the public fancy our jobs as the best of the best. If it is our goal to make a difference in management and help others be better stewards of our limited and quite precious natural resources, I believe we need to move our students from learners to teachers.

THE I'S AND E'S OF EDUCATION

Therefore, I feel we need to think about putting the *I's* and *E's* into our teaching so, at least, when our students are *Imitating* their professors, the models will be beneficial and positive. We should *Encourage* our students who plan to be formal or nonformal educators to take several *Education* courses. Such courses give students the philosophy of education, the learning theories, the techniques of educational testing, and the psychology of education—all of which build a solid theoretical foundation from which to teach about our resource base.

Some professors believe that their job is to put out the information and it is the students' job to get it. Yet, we all know in today's world of video games and the instant gratification of the Internet, we must be able to compete for at least their minds, if not their hearts. While most of us may not be entertainers, all of us can be *Entertaining*. We don't have to be good song and dance people, but we need to be better than boring and *Endorse* the idea that learning should be fun and we can all be *Exuberant* about our subjects. We can laugh and still be good teachers.

Educators should show *Empathy* with their students. While college might well be the most carefree segment of their adult lives, it is a tough time in many ways. Students have problems with school, life, roommates, professors, and we must understand and make reasonable allowances for these stressors. I believe we need to be rigorous and challenging in our education process, while being understanding, compassionate, and caring. We are witnessing in a small way the transition of child to adult, and we play a part in the ageless process that started with the dawn of our species. *Invest* some of yourself in your students; the dividends are remarkable. *Entrust* them to make good decisions and be comfortable with the ones they make.

Many of our students hide or just lose themselves in the numbers of larger classes, and frankly, some mornings it is easier to lecture to a sea of faceless names than to *Individualize* the process. I think we must *Engage* these students even at 7:50 a.m. Ask them for *Input* on ideas, on lectures, on exams; make them part of the learning process from the beginning. *Encourage* them to cast off passive learning models. *Enhance* and build on their *Examples* and draw out their willingness to *Express* themselves. Make them an *Important* attribute of your lecture. Their *Experiences* will enrich your lessons because they more closely fit the reality of your students' lives. Many of my students this year were only in the third grade when Desert Storm was in the headlines and 99 percent of them weren't even born during the Viet Nam era. Therefore, many of the stories I might relate from my college days do not fit their reality.

Enlist their support for your projects and programs; most of them would love to help if only asked. They will relate to you on a different level and learn that you put your boots on one foot at a time like everyone else.

Some of my advisees come in and complain that an instructor shows no *Enthusiasm* or *Emotion* for his or her subject. You and I are here because we are impassioned idealists about our subjects, our work, our ideas, or our specific natural resources genre. Look for ways to *Ignite* that same fire in their souls, as we have in ours. We should *Encourage* our students to keep their intellectual fires burning in the future. Lifelong learning is a concept we all should embrace.

It is all right to be *Enthusiastic* and *Excited* about what we teach. Stand on a chair, raise your voice, charge to the back of the room to make a point, leave the security of the lectern and move out into the room. They don't bite, even if you get next to them. Have them close their eyes and *Imagine* with you, using their mind's eye to move to new visions, to see an ecosystem, a biological process, or a unique animal behavior. Believe me—they won't fall asleep. Crank up the volume or kick it up a notch. Be *Innovative*, try new things—not all of them will work, but no one is keeping score.

As I already said and you likely know, often times, students try to hide in large classes, so they do not have to participate. *Encroach* on their space; *Invade* the seat next to them, talk with them as you lecture, ask them for help on a point or ask what do they think. Very few students won't talk with you when you sit down next to them and speak with them while the rest of the class *Eavesdrops* on your conversation. However, I must admit it was easier when they didn't bolt the chairs to the floor in nice neat straight rows.

Involve them in the teaching process and make them responsible for at least part of their education. On my best day, I don't think I could explain how to use a secchi disk or a clinometer nearly as well as a fisheries student or a forestry student who knows their field techniques. It is their class; make them a part of it. Make them teachers, as well as learners.

Evaluate them fairly and make them create a part of the testing *Instrument*. One of the requirements in my class is that each student writes five test questions. I use the questions on the exams and students are genuinely pleased to see their questions are part of the tests. Usually, they groan when given the assignment, but I have never had them tell me to get rid of that requirement.

Empower them to lecture to the class and test on their presentations. I want my students to know about some of the important writers in the field of natural resources; I assign group papers and presentations on selected writers. Early in the semester, students often do not show each other the respect of listening to their peers' presentations. However, that changes after the first exam when questions are drawn from the presentations. The class learns about authors and the groups have become part of the teaching process.

Expose them to the opposite view point from yours, *Embroid* them in the times, issues and controversies of the day, and then excuse yourself as a participant and referee the discussion. As a result of this *Immersion* into controlled conflict, they will learn how to disagree with peers in a professional manner.

Invite others to lecture in your class. Give yourself a break, but more importantly provide students a chance to *Envision* what they might become. These invited guests allow students to directly *Interact* and *Engage* a famous person or appreciate the experiences gleaned from the school of life. I would love to say that my students rate one of my lectures as the best of the year; however, that honor usually goes to our building custodian and his son. Both are trappers, and they have a wildlife damage management business together. They talk to my class about how to trap and why they trap. They express their respect and dedication to the resource they use. In five years of teaching this class, Dave and Nathan have won the best lecture title hands down—simple, honest men, making a living, in part, from the land, not educated in a formal manner, but teachers in the purest sense of the word. Their honesty and their commitment to their craft have never failed to win my students over.

CLOSING

We should seek to *Exemplify* the best that we can be. We want students who will *Emulate* our good *Examples*. We need to escape from the same, old, traditional ways of doing things. We need to risk and give up some of the control that we, as teachers, have clung to in our classes. When you *Expect* more from individuals, more often than not, you will get it. I am suggesting that you try this *Invigorating* way to teach, but recognize that it can be frustrating. Yet at the end of the semester, everyone in class including me, have moved farther along a continuum from learner to teacher, and I believe that movement will enhance resource sustainability as we all teach about our world and more people learn to become teachers. *Enjoy!*

UNDERGRADUATE ENROLLMENT IN NATURAL RESOURCE PROGRAMS: DEMAND AND REALITY

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ABSTRACT: Many of us involved in enrollment management in University Education in Natural Resources have experienced declines in undergraduate enrollment and face challenges in recruiting students from under-represented groups. At the same time local, state, and federal natural resources-related agencies tell us that in the next 5-10 years demand for our graduates will be the greatest it has been in 30 years. Furthermore, these agencies expect to hire a diverse workforce. Is there something wrong with this picture? Are there things we can do as a group to meet our own enrollment goals and the goals of the agencies and corporations? Questions to be

addressed could include the following: What are the undergraduate enrollment trends? How can we attract a diverse student body? Are there common enrollment trends and challenges? What are the natural resource agencies' and companies' needs and expectations of a workforce? Are there discrepancies in what we have and what they want? Do we need to rethink our recruitment strategies? How can we, as a group, build a coalition to address these questions? Potential end results of this discussion might include a better understanding of a particular programs' enrollment standing among natural resource programs in the United States. We may gain insight into how to use workforce expectations in our recruiting efforts. We can make recommendations to employers on how they can help us meet all parties' expectations. We will determine if, why, and how we should build a network of enrollment/diversity specialists to better represent our concerns to universities, agencies, and companies. At the very least we will strengthen a previously inconspicuous camaraderie among people dealing with enrollment and diversity in University Education in Natural Resources.

WHAT TO TEACH IN FOREST MANAGEMENT AND HOW TO TEACH IT

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ABSTRACT: More than ever, forest management today encompasses a wide range of topics, from ecosystem management and public forest planning to the details of industrial timber management, including financial analysis. The discussion will provide a forum where individuals who teach forest management can discuss their ideas on what should be emphasized in forest management classes and effective methods for teaching these concepts. As preparation for the conference, I will obtain syllabi for forest management classes around the country and internationally. These will be used to develop a list of the range of subjects currently taught in these classes and methods used for teaching them. A synopsis of this review, including copies of all of the syllabi that are obtained, will be distributed to participants. The desired outcome of the discussion is that forest management instructors will revisit their current course content and teaching methods, possibly identifying needed changes in emphasis and/or new teaching approaches. The discussion will involve all those who show up.

FROM “NATURAL RESOURCES” TO “ENVIRONMENT”: BROADENING OUR MISSION AND MESSAGE

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ABSTRACT: This important conference (the fourth in a series) addresses higher education in “natural resources.” Indeed, most participants are affiliated with programs, departments, schools, or colleges of natural resources and/or related professional terms such as conservation, forestry, wildlife biology, range science, and park management. By professional standards, these areas of study and practice are relatively young. However, the words we use to describe them (and ourselves) are a century or more old. Gifford Pinchot was America’s first professional forester, and he coined the word “conservation” early in his career (or so he writes in his book, *Breaking New Ground*). The Conservation Movement of the late nineteenth and early twentieth centuries was founded on the principle that we need to “manage our natural resources more efficiently” through application of

science and technology, and this idea was at the heart of emerging professions such as forestry, fish and game management, range science, and water resource development. However, times have changed and so, perhaps, should our terminology. Development of the science of ecology has emphasized the interconnectedness of living things, suggesting that humans are part of the natural environment and that we may even have moral obligations to other living things. The Environmental Movement of recent decades is founded on the need to restore and protect the integrity of nature and to preserve critical natural areas and processes. Contemporary concerns over social and environmental justice suggest that we must become more inclusive in formulating and implementing natural resource and environmental policy. Based on this evolution of ideas, we respectfully suggest that we consider broadening the name of our academic units to include the word “environment.” (To their credit, a number of institutions have moved ahead in this regard.) We believe this more accurately reflects our contemporary academic mission and broadens our message in ways that strengthen our connections with traditionally underrepresented groups and concerns. Compared with the term “natural resources,” the word “environment” may (1) connote a less exclusively instrumental or anthropocentric worldview that is more in keeping with contemporary society; (2) resonate more powerfully with Native American, African American, “Eastern,” and other non-Western, more biocentric cultures; (3) broaden our prospective and focus from the traditional “big outdoors” of forests, parks, wilderness, and wildlife refuges to communities, homes, and workplaces, along with their attendant environmental issues; and (4) extend our concerns from the natural to the social sciences, and especially to the multidisciplinary interface between humans and nature, the crux of modern environmental paradigms such as sustainability and ecosystem management.

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LOOKING BEFORE WE LEAP: A THREE-PART STUDY TO PREPARE FOR COLLEGE REORGANIZATION

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ABSTRACT: In Spring 2001 the College of Natural Resources at Utah State University voted on a plan for reorganization of departments and curricula that is intended to better reflect future natural resource science and management needs. To prepare for curriculum redesign we evaluated the career objectives and educational needs of undergraduate students in natural resources and related fields by means of a three-part study of relevant groups: current students, public agency professionals, and prospective students who chose nonnatural resources majors. Students typically seek traditional jobs with public agencies, but a large proportion also expect to attend graduate school. Comparison of seniors and underclassmen found that the latter were less pragmatic in their expressed career goals, and also showed greater appreciation for the human dimension of natural resources management. Agency professionals identified “people skills” as critical to success in public land management, and expressed a wish that they’d had more of those kinds of courses in college. About half reported that their jobs were quite different from what they’d anticipated as students. Focus groups with nonnatural resources majors found that these students had strikingly similar career goals but felt majors in natural resources are too narrow, too scientific, and/or too unscientific to help them achieve those goals. Implications for the college as it undertakes reorganization is that curricula should continue to balance natural science and statistics courses with classes that provide understanding of people. Improved advisement could help students gain more realistic expectations about their futures. In addition the college may want to consider efforts to better market itself within the university.

INTRODUCTION

The faculty of the College of Natural Resources (CNR) at Utah State University (USU) voted in Spring 2001 on a reorganization plan that reduced the size of the college from four to three departments, which have been reconfigured to reflect beliefs about the knowledge and skills that are most likely to be needed to address the most challenging issues of the upcoming decades. Curricula of the college's undergraduate majors are to be redesigned to fit these new priorities and the strengths of the new departments' faculties. College administrators anticipate that these new, stronger curricula will be designed to retain current CNR majors, recruit potential students, and, ultimately, produce more effective natural resource managers.

At the time of the reorganization vote, the college consisted of four departments which offered Bachelor of Science degrees in the following majors (in parentheses): Fisheries and Wildlife (Fisheries and Wildlife); Forest Resources (Environmental Studies, Forestry, Recreation Resource Management); Geography and Earth Resources (Geography); and Rangeland Resources (Rangeland Resources). An interdepartmental program in Watershed Science also offered a Bachelor of Science degree. After reorganization the majors were redistributed to three new departments as follows:

- Department of Aquatic, Watershed and Earth Resources (AWER): Watershed Science, fisheries portion of Fisheries and Wildlife.
- Department of Environment and Society (EnvS): Environmental Studies, Geography, Recreation Resource Management.
- Department of Forest, Range and Wildlife Sciences (FRWS): Forestry, Rangeland Resources, wildlife portion of Fisheries and Wildlife.

As this is written, the AWER and FRWS departments are pursuing new undergraduate majors that reflect their expertise in aquatic ecology and earth systems science, and ecosystem restoration and conservation biology, respectively.

This study was designed to assist in curriculum development and the reorganization process by means of case studies of three relevant groups. The groups, and the research objectives within each, were as follows: current CNR students, to identify educational and career goals; public agency professionals, to identify courses and skills necessary for natural resource management positions; and students in closely related, non-CNR majors, to identify educational and career goals and reasons for choosing other majors.

THREE RELATED STUDIES

Because reorganization was intended to strengthen CNR curricula and make them more relevant to current and future problems, we need to be able understand what current and future natural resources professionals need and want from an undergraduate education. Because it was also intended to help the college become more attractive to future students, we also needed to understand why students choose—or do not choose—CNR majors. Accordingly we undertook three separate but related studies, each of which applied methods of the social sciences to better understand important constituencies. We surveyed students in four of the college's larger required courses—two that consist primarily of lower-division students (“Professional Orientation to Forest Resources”; “Natural Resources and Society”) and graduating seniors (“Quantitative Assessment for Natural Resources”; “Ecosystem Management”). In addition, we interviewed employees at two federal land-management offices. Finally, focus groups were organized to gather information from students who were identified as “likely” CNR majors but had chosen other programs.

Current Natural Resources Students

Surveys of CNR students were designed to better understand the people who are currently pursuing natural resource degrees: Why have they chosen those majors? How do they feel about the education they are receiving?

Are they satisfied with their choices of majors? Do they feel prepared to enter natural resource management professions? A total of 139 surveys were collected from four classes between November 2001 and January 2002. Of those surveyed, 65 (47%) were seniors and 74 (53%) members of other graduating classes. The classes were selected in order to get a broad cross-section of CNR majors and, in further analysis, to compare freshmen and seniors. The major with the largest number of respondents was Fisheries and Wildlife (28% of surveys), followed by Environmental Studies (25%), Recreation Resource Management (15%), Forestry (11%), Geography (10%), Rangeland Resources (7%), and Watershed Science (3%). This distribution roughly represents the proportions of majors within the college except that Environmental Studies and Recreation majors were slightly oversampled and Fisheries and Wildlife and Geography majors slightly undersampled.

When asked why they chose a natural resources major, every respondent expressed interest in nature and its management or protection. Lower classmen more often identified reasons such as “I love nature” or “I want to work outdoors” than seniors. Seniors more often cited employment after graduation or internships and jobs while in school than did other students. Non-seniors were more interested in human dimensions of natural resources and their integration with ecology than seniors, who were slightly more interested in specific topics and components of ecosystems (wildlife, trees, etc.).

Most students want to work in the public sector, with 46% seeking careers with public land-management agencies and 15% with state or local governments. The next most frequently mentioned categories were environmental consulting firms (7%) and research organizations (6%).

One question that particularly interested us was “If you had your college education to do over, would you do it differently?” A majority (68%) indicated they would not change their college educational path. Not surprisingly, seniors were slightly more likely to express regret at their choice (38% of all seniors) than underclassmen (26%), who had not yet had time to experience most of the courses in their majors. Of the minority of students who wished they’d done things differently, a majority would have chosen a different major within the college, or would have taken less time to settle upon a major. Those who wish they had chosen a major outside the college typically said they would have found more options and better financial stability with a non-CNR major.

Increasingly students are told—by their teachers or faculty advisors, or by others outside the university—that they will not be able to reach their career aspirations without obtaining a graduate degree. Because of this circumstance, and because the faculty have an ongoing debate about whether their primary purpose is to prepare students for management careers or for graduate study, we were especially interested in learning more about students’ plans for advanced degrees. Just over half of CNR students (56%) want to pursue a graduate degree. A Master’s degree is the most sought-after, desired by 74% of those planning to attend graduate school. However, grade-point averages of students anticipating graduate degrees suggest that many students will be disappointed to learn their GPAs are too low for admission to graduate school (Table 1).

Table 1. Are Plans for Graduate Education Realistic?

Status	Do you plan to attend graduate school?	Cumulative GPA % responses					Total %
		4.0-3.5	3.4-3.0	2.9-2.5	2.4-2.0	<1.9	
Seniors	Yes	20	23	16	3	0	63
	No	5	16	14	3	0	38
Non-Seniors	Yes	17	22	10	4	1	54
	No	17	14	13	3	0	46

Public Agency Professionals

If most CNR majors want to end up working for a federal agency, then it's important to understand what skills are likely to be necessary for successful careers in public land agencies. Accordingly the senior author interviewed employees at two U.S. Department of Interior offices: the Bureau of Land Management field office in Monticello, Utah, and National Park Service office at Glen Canyon National Recreation Area headquartered in Page, Arizona. The sample group was comprised of natural and cultural resource managers, including both permanent and temporary employees. The study was designed to be a qualitative analysis, not to provide statistically significant (quantitative) data, although numeric data were gathered and are reported where appropriate in figures and tables. A total of 25 interviews (of 27 total employees) were conducted ranging from 10 minutes to 2 hours.

A synthesis of data obtained from the interviewees found that for most a college education provides

- A baseline education and introduction to issues professionals would face
- Basic understanding of law, rights, environmental evidence, and decision making
- A learning environment for integrity and professionalism
- A scientific background and an analytical approach for making management decisions

However, nearly half found their current jobs to be completely different than what they anticipated while they were in college. Similarly, only half recognize a strong correlation between their college education and their current jobs. Those with the most pinpointed career goals found the most relevance; those with broad goals found varying degrees of relevance. Among the aspects of their jobs that interviewees did not anticipate were

- Extensive involvement with people, supervising, and interaction with various interest groups
- The decline in fieldwork and increase in office supervision associated with job advancement
- Inflexibility of a bureaucracy coupled with the influence of politics
- A great deal of office work

The college courses that respondents judged most valuable were math and science (76% of respondents) and human dimensions classes such as policy or archaeology (32%). Twenty percent said their most valuable college experiences had been the completion of a Master's thesis or large research project, because those kinds of activities gave valuable practice at independently completing large projects with distant or indistinct deadlines. The consensus was that college classes gave agency professionals an adequate foundation, while job training and experience filled in gaps. When asked what classes they wished they'd taken, the most common categories of courses were human relations, computers, technical training, science, and statistics.

When asked what skills (as opposed to specific courses) were most necessary to a successful agency career, a surprising 80% mentioned people/communication skills such as teamwork, interpersonal relationships, public speaking, confrontation and negotiation, and supervisory techniques. Other skills mentioned by one or more interviewees included science; writing; organization; budgeting; math/statistics; and practical application of theoretical concepts.

Although respondents nearly unanimously found value in their college educations, many felt unprepared in certain aspects of their current jobs, especially dealing with people. They identified a need to learn within the context of management and law, and many respondents felt that these skills cannot be taught in college. Agency professionals emphasized a need for technical competency, knowledge of the sciences, and the ability to interact with people.

Students in Closely Related Majors

There are many opportunities to pursue a career associated with natural resources and the environment, including majors that offer environmental curricula outside the College of Natural Resources. Our work with this group examined many of the same topics as in the study of CNR majors—What factors led to their decision to pursue their current majors? What are their specific career goals?—but also was intended to discover why students chose a major dealing with nature and the environment outside CNR.

We convened focus groups where we conducted informal conversations over pizza, lasting approximately one hour, with students in several different majors with small-enrollment programs having a focus on nature and the environment. These majors included Landscape Architecture and Environmental Planning, American Studies, Parks and Recreation, and Environmental Soil and Water Science. In addition we contacted student employees of the university's Outdoor Recreation Center.

Since we suspected that decisions not to major in the college were related to the CNR image, we asked focus group participants the question, “What comes to mind when you hear ‘College of Natural Resources?’” The answers came in two primary categories, people and topics:

- People: Paul Bunyan (a somewhat controversial symbol of the college featured prominently in some student activities), great professors and friends, “big-bearded fellows with beefy waist belts [and] coffee mugs, carabineered to backpacks,” “liberals and granolas”
- Subjects: Forestry, Range, Environmental Studies, nature, policy, “opinionated science,” government agencies.

Discussions with the sampled groups suggested that non-CNR majors understand the complex nature of natural resource management but feel they can approach environment-related careers from other angles. When asked why they did not choose a CNR major, most respondents said they had considered and rejected the college, although a few didn't even know it existed until joining the focus groups. Some participants said the college's majors are “too ecological” while others felt the curricula contain too much social science. The college's approach was said to be “too narrow” by some students, who said there were no appealing degrees within the college. Others said CNR majors wouldn't offer them the kinds of careers they desired because natural resource management careers don't pay well or “It's easier to save the world with a different degree.” However, the desired jobs and training of these students were strikingly similar to those of CNR undergraduates. Focus group participants typically want to work for a government agency, state/local government, nonprofit environmental group or a private environmental firm. When asked whether they had chosen the “right” major, the answer was a resounding “Yes!” Not one would have opted for a CNR major at this point in his education.

NOW WHAT? IMPLICATIONS FOR CURRICULUM REDESIGN

As a reorganized College of Natural Resources considers new majors and revises existing ones, results of this survey can inform the curriculum design process. Some of the themes we see in our results are

1. Strike a social/ecological balance: Agency professionals identified a need for better “people skills,” but also for technical expertise and computer competency. The deficiencies they identified in their college educations might be eliminated by requiring classes and field experience that can provide students with a basis of all three identified needs. Curriculum should reflect current informational technologies, and field and technical skills should remain as a major emphasis of natural resources curricula, but designers of the new curricula should beware the pitfalls of reducing human dimensions content to provide a stronger basic science foundation.
2. Reinforce communication skills as often as possible, through specific courses in communication but also by incorporating principles of “writing and speaking across the curriculum” in the college's own courses.

3. **Improved advising:** One of the more striking findings of this study was a disconnection between the expectations of students to attend graduate school and academic attainments of some of those students. Utah State University, like many western land-grant universities, has an open-admissions policy for undergraduates whereby nearly all high school graduates are granted admission to college. As a result, students may be unaware of the entrance requirements for graduate schools. Conversely those entrance requirements are second nature to faculty members who may assume their students are equally aware of the rules. Faculty advisors should discuss graduate school plans with their advisees as soon as possible so that the need for academic success can be emphasized early in the undergraduate career.

A second advising issue is with non-majors, many of whom may have investigated the College of Natural Resources at some point as high school seniors or recent arrivals at the university. Many of the non-majors we contacted were unaware of the breadth of options within the college, and therefore rejected its programs as being too narrow, too science-oriented, or not science-oriented enough.

4. **Intra-university marketing:** A related issue is the overall image of the College of Natural Resources. Not only does it appear that Utah State students are unaware of the breadth of the programs within the college, they also appear unaware of the breadth of the students, who are often seen as either unusually liberal for a relatively conservative university in a conservative state, or else as too conservative to meet the needs of someone who wants to “save the world.” It seems that one factor in the college’s “image problem” is the symbolism of the mythic lumberjack Paul Bunyan, represented by a large chainsaw sculpture that is featured prominently in the annual Natural Resources Week celebration.
5. **Continue monitoring CNR students:** Much of the information obtained by this study was unknown to college faculty. We recommend repeating this study at regular intervals so faculty and administrators can keep tabs on who their students are, where they are coming from, and where they want to end up.

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WEB-BASED TECHNOLOGY IN UNDERGRADUATE INSTRUCTION: A PRIMER FOR MOVING BEYOND ACCESSIBILITY TO MEASURES OF EFFICIENCY

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ABSTRACT: Inarguably, the Internet has revolutionized the manner and speed of information transfer. The Internet as a course supplement represents a new reality in higher education and has moved from a novelty to a near obligatory component in course instruction today. Arguments for and against the use of the Internet in pedagogy have been made. For example, in plant identification courses the Internet allows students to experience the visual component of flora that is often difficult to bring into the classroom. However, the Internet can also add a significant time sink to already overtaxed university instructors, who likely maintain research programs, outreach and service, and instruction, often without assistance from teaching assistants or office staff in preparing Internet materials. It is within the context of these tradeoffs that the questions of this poster were born: How do we measure the efficiency of the Internet in pedagogical scholarship in higher education when expectations for research, service, and outreach have not diminished? As educators, we must advance from the generic methods of course evaluations (e.g., student postclass reviews) to the development of metrics that critically and fairly evaluate the effectiveness and teaching/learning efficiency of Internet instruction, both from the student's perspective (which we believe has already begun), as well as from the instructor's.

To begin development and discussion of these metrics, we examined long-term trends in student evaluations (1996-2001) from an Internet-supplemented course taught at the University of Wisconsin-Madison by Dr. Phillip Barak to: (1) test the assumption that students have grown comfortable using the Internet, and (2) assess the evolution of student behavior using the Internet as a course supplement. This annual, 3-credit, junior-level course served as the model in our analysis. These data are presented as a primer to foster discussion and future research in this area.

We chose this course for analysis because it formally pioneered the Internet as a classroom supplement and, most important, because records of student feedback pertaining to Internet usage had been assessed since 1996 using essentially the same questionnaire. This course serves as the main undergraduate class for teaching management of plant nutrients and enrolls both undergraduates in soil science as well as students from agronomy and horticulture. The course consists of two lecture periods and one two-hour laboratory per week, with an enrollment of 30 to 40 students.

Beginning in 1996, the Internet plays a significant role in this course by providing a stand-alone Web resource entitled "Essential Elements of Plant Growth" and class material consisting of lesson-by-lesson course information, announcements, assignments, online readings, postclass notes, e-mail connections, and links to external Web sites. In addition, it provides interactive 3-D chemical models as part of "The Virtual Museum of Minerals and Molecules." Internet usage in this course was not designed as an alternative to the teacher-student lecture or person-person contact. Instead, it was viewed as a course supplement by which instruction could be extended to all hours of the day and all days of the week, increasing time on task by the students with course material and objectives. In other words, the Web was not intended to replace the classroom with distance education, but to enhance residence education by greater proximity and interactivity.

Student grades are determined on the basis of three exams, including the final (each counting 20%), lab work (15%), lab exams (15%), and five calculational problem sets distributed during the semester (10%). There were no grade rewards attached to student use of the Internet portion of this course. However, without using the supplemental information provided by the Internet, student performance was, at best, diminished, and at worst, suf-

ferred considerably. Students were provided a formal opportunity to anonymously evaluate the effectiveness of the Internet components one week before the final exam using a combination of multiple-choice questions and short open-ended essay questions. They were also encouraged to provide written feedback, from which our analysis also draws. This format provided the freedom for students to contribute honest evaluations without risk of consequence and provided the data used in our study.

Examining the six-year record of student responses, we found that the novelty of the Internet has diminished to the point that students now expect that Internet-based technology accompany traditional classroom instruction. Students have progressed from being unfamiliar with the Internet to a comfort level where they now possess the experience to critically evaluate our Internet-based instruction; by 1997, all students declare themselves comfortable with using the Internet. In the six-year period, Internet access has largely moved from access points at the university to home computers, and the frequency of visiting the course site has been at least once per week over the six years of our study. Students are now concerned with the efficiency by which they can extract information from course Web sites rather than how to gain access. However, the Internet supplement does not appear to have caused a decline in class attendance since its inception in 1996, nor has it decreased the need for a direct student-teacher relationship. Students appear to be increasingly more inclined to attend courses with Internet supplements, as opposed to those that do not offer this technology.

Regardless of our individual level of enthusiasm for using this technology, our data suggest that most students now encourage, if not expect, the use of Internet-based course material by instructors. Students have moved from concerns concerning mechanical difficulties with usage (e.g., download times on 14.4 kbs modems, access through the phone modem pool, and availability of color printing) to concerns with the quality and delivery of Web-based information. We believe that in future years educators and administrations will increasingly evaluate the teaching/learning effectiveness of combining Internet technology with traditional classroom instruction. Moreover, advancements in Internet technology have and continue to evolve quickly, forcing educators to learn and maintain their command of a teaching tool for which they may be judged.

If Internet course materials are just a substitute for "Bob's Copy Shop," then pedagogy has not progressed much through this technology. In the glitz of the information era, it is easy to miss that the key element in pedagogy is *interactivity and learning*, not information per se. The true advantage of the Internet in pedagogy is its interactivity, both students with the material and students with instructors, which simply further extends one of the core concepts of the successful traditional classroom.

Therefore, a discussion and development of new metrics that evaluate the efficiency and effectiveness of the Internet in pedagogy must begin in earnest so that the tradeoffs between enhanced learning and the time and effort it takes to maintain this electronic environment can be evaluated quantitatively. To this end, we intend to expand this study to include other courses around the country that have and currently maintain Internet-based classroom supplements.

CHARACTERIZING UNDERGRADUATE FORESTRY MAJORS AT SOUTHERN ILLINOIS UNIVERSITY

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ABSTRACT: A survey administered to undergraduate students (n=74; 94% response rate) enrolled in Forestry 100: "Introduction to Forestry" contained questions addressing student background, early life experiences, exposure to natural resources, and goals and aspirations as a student in forestry at Southern Illinois University (SIU). Information from this questionnaire represents the first stage of data collection in an ongoing study tracking students over the course of their academic careers. Data collection will culminate in a senior exit interview. The purpose of the first stage is to better understand social, environmental, and familial influences that motivate students to pursue careers in natural resources. Preliminary analysis of students' understanding of public valuation of natural resources exhibits a normal distribution slightly skewed toward negative perceptions. Students' understanding of the public's view of forestry elicits a similar mixed response. The majority of students report no previous family ties to the department. Initial results suggest that youthful experiences with natural resources may have more bearing on career choice by SIU forestry students than a family legacy.

DISTANCE EDUCATION COURSES IN NATURAL RESOURCES THROUGH THE DEPARTMENT OF FISHERIES AND WILDLIFE AT OREGON STATE UNIVERSITY

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The Department of Fisheries and Wildlife at Oregon State University offers seven courses for distance delivery:

FW251. *Principles of Wildlife Conservation*

FW303. *Survey of Geographic Information Systems in Natural Resources* (Internet)

FW311. *Biology of Birds*

FW323. *Management Principles of Pacific Salmon in the Northwest*

FW340. *Multicultural Perspectives in Natural Resources*

FW435/535. *Wildlife in Agricultural Ecosystems*

FW470/570. *Ecology and History: Landscapes of the Columbia Basin*

Two delivery methods are employed for these courses—video (6 courses) and Internet (1 course). Full course lectures are available on VHS video. Discussions, e-mail, and assignments are completed on the Internet. Enrollment in Fisheries and Wildlife distance courses has doubled nearly every year since the first course was designed in 1996, mirroring increased interest in distance education nationally. Students have been as far away as Namibia and Italy and from over 30 states. These fully accredited courses meet the needs of military personnel and others in pursuit of the OSU distance degrees in Natural Resources or Environmental Science, on-campus students with schedule conflicts, departmental majors with family responsibilities out of the local area, people exploring career changes, and professionals seeking advancement.

THE INFLUENCE OF STUDENT CHARACTERISTICS IN THEIR EVALUATION OF A PARK-PLANNING COURSE WEB SITE

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ABSTRACT: Course Web sites are increasingly used in university instruction, despite the fact that their effectiveness has not been adequately evaluated. This study examined students' use of and perception about the official Web site of a park-planning course in the College of Natural Resources at NCSU. A questionnaire was administered to 56 students in 2000 and 2001. Results show that many students used the Web site often, and the majority of the students preferred Web sites in future courses. The perceptions of Web site utility and the preferences of Web-only courses vary among students by age, gender, level of computer experience, and learning style. These results are presented and the implications are discussed in this poster.

RECREATION GPS AS A LOW-COST ALTERNATIVE FOR INTRODUCTORY COURSES IN NATURAL RESOURCES

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The Global Positioning System (GPS) has proven reliable for collecting spatial data for integration into a computer-based Geographic Information System (GIS). However, high cost often prohibits the purchase of individual GPS units for each student in a class. Recent advances in technology coupled with decreasing prices have made recreational GPS a low-cost alternative for introductory courses in Natural Resource Management. These units utilize 12-channel receivers, range in price from \$115 to \$500, and exhibit a point-location accuracy within 14 meters 95% of the time (6.2m - 66% of the time). Although recreational units lack the capacity for differential correction through postprocessing, the addition of real-time differential correction can improve accuracy to less than 9 meters 95% of the time in areas where free differential correction signals are obtainable (4.2m - 66% of the time). Several free computer programs are available for retrieving data from a recreational GPS directly into a GIS. Still others exist as stand-alone software that allows image registration for GPS data overlay. Thus, it is now feasible for students to purchase their own GPS unit for use in introductory classes, in advanced courses, in their research, or in any endeavor requiring spatial data collection for computer-based mapping.

DEVELOPMENT OF A GRADUATE SPECIALIZATION IN PROTECTED AREAS MANAGEMENT

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The International Union for the Conservation of Nature defines a protected area as “an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.” IUCN has six protected area categories based on variations in management objectives. We see a growing demand for students who currently are managers of such areas, work for NGO’s or the government in some capacity and who want to intervene in order to cause some change in the way a given protected area is managed. Participation by local communities is a key component of such intervention. The demand comes primarily from protected areas managers in Southeast Asia, Latin/South America, and Africa, but the issues and lessons learned have wider geographic implications. Ecotourism is often advocated as an intervention strategy, but most managers do not understand how to apply the concept in practice or its potential impacts. The proposed graduate specialization is interdisciplinary, combining natural and social sciences (policy, law, park and wildlife management, GIS, conservation biology, community forestry and social/environmental/economic impacts). The poster presents the structure of the specialization as conceived by faculty from Forestry, Sociology, Fisheries and Wildlife, and Park Management.

ESTABLISHING A LEARNING COMMUNITY IN AN UNDERGRADUATE NATURAL RESOURCE-BASED RECREATION PROGRAM

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Island mentality is the rule in course and curriculum design. Faculty typically design courses based primarily on the instructor’s prior experience and perhaps, but all too rarely, communications with a few colleagues and managers. Key components of the educational system, including clients, students, and practitioners, are not at the table when such courses are designed and evaluated prior to being offered. Without attempting to develop such a “community of learners,” important educational opportunities are missed. Building on the works of Peter Senge (learning organizations) and Parker Palmer (learning communities), a small-scale “experiment” in building a learning community to guide the flow of content and assignments in a set of linked courses will be conducted before the conference in March. The conceptual framework for and results of this effort will be the topic of the poster. The immediate goal is to construct a learning community and have this group design “hands-on” assignments that are linked throughout a student’s program from the 200- to the 400-level. A long-range goal is to foster a lifelong perspective on learning that involves obtaining current knowledge quickly from diverse sources versus a one-way flow of information that discourages seeking additional knowledge.

A NEW PROFESSIONAL DEVELOPMENT COURSE FOR DOCTORAL STUDENTS

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As part of a new Ph.D. program in NC State's Department of Parks, Recreation and Tourism Management, I designed a three-hour professional development course to help prepare students for positions on college and university faculties. One goal of the course is to cultivate students' interest and ability in reading books, both those directly in their area of specialty and others more tangentially related. During the course, students will read and discuss seven books, three about collegiate faculty roles and four offering various perspectives on a topic in natural resources-based recreation. The second goal of the course is to provoke and deepen students' thinking about faculty lives through readings and discussion with highly engaged faculty. Areas addressed will include the variety of institutional settings in which faculty work, teaching, research, engagement (outreach), and reappointment/promotion/tenure.

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