Breathing Life Into the Case Study Approach:  
Active Learning in an Introductory  
Natural Resource Management Class  

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The authors describe the pedagogical theory, practical applications, and results of an innovative effort to realign a first-year course. The course seeks to foster students’ engagement in learning new information while developing critical-thinking skills. The course’s holistic approach includes three increasingly complex case studies in both lecture and laboratory format. The case studies incorporate guest speakers, Internet resources, cooperative learning, and in-class simulations within a consistent framework. The authors argue that the increasing complexity and variation of the kinds of case study problems stimulates students’ critical thinking by challenging them to apply newly learned concepts in different contexts.

As newcomers to academic communities, student learners undergo a challenging transition. Students in introductory courses must adjust to new ways of teaching and to classroom norms that differ from their earlier experiences (Erickson & Strommer, 1991; Grossman, 1994). In high school, students expect teacher-led review of assigned readings in class, frequent tests that cover brief bits of material, problem solving that rarely progresses to greater degrees of difficulty, and homework comprised mostly of “busywork” (Erickson & Strommer, 1991). At colleges and universities, however, students generally have less interaction with faculty; they may arrive with weak study skills and little familiarity with library resources (Steidle, 2000).

During their college years, students gradually change their perceptions of what constitutes “learning.” In early adulthood, students begin...
to move away gradually from viewing knowledge as truth—facts, correct theories, and right answers—toward viewing faculty as authorities who possess such truths (Erickson & Strommer, 1991; Grossman, 1994). Students in this transitional developmental phase may resist assignments requiring them to state their own opinions or to learn from their peers (Erickson & Strommer, 1991).

Another major challenge for faculty who teach incoming students is that professional development requires more of learners today than the rote learning of yesteryear. Particularly in the applied science fields such as natural resource management, professionals confront increasingly complex problems. Heightened conflicts among stakeholders of resources and public demand that management decision making be held accountable present critical challenges for today’s natural resource professionals (Ryan & Campa, 2000). Given such challenges, early-career professionals need more than just a technical understanding of ecological subjects. The natural resource profession requires a commitment to lifelong learning, well-developed critical thinking skills (analysis, synthesis, evaluation), effective communication and problem-solving skills, and the ability to work well in multidisciplinary teams (Ryan & Campa, 2000).

Case studies represent one useful and pedagogically sound approach to foster active learning and critical thinking. The purpose of this article is to describe the pedagogical theory, practical applications, and results of an innovative effort to invigorate a freshman-level course. The effort uses case studies to engage students’ in learning new information, developing critical-thinking skills, and making decisions about career choices and personal goals.

**Pedagogical Theory Supporting the Use of Case Studies in an Introductory Course**

The case study method of teaching represents a subset of a wide array of pedagogical techniques that foster active learning (Ryan & Campa, 2000). A case study provides a “narrative of an actual event that brings students and teachers together in an attempt to examine, discuss and advance solutions to a realistic problem situation” (Myers & Jones, 1993, p. 103). Case studies consist of more than a random collection of narratives, however. Their preparation and use requires a substantial investment of time and energy on the part of faculty (Grossman, 1994; Ryan & Campa, 2000). In fact, “A successful case study involves many features characteristic of active learning: student-teacher interaction, collaboration, problem solving, reflection, and extensive discussion”
Breathing Life Into Case Studies

The best case studies offer a dilemma that elicits a multitude of diverse responses and recommendations from students (Myers & Jones, 1993). Such case studies invite analysis, promote discussion and reflection, and provide the impetus for further research (Myers & Jones, 1993).

Educators can greatly enhance the effectiveness of case studies by applying experiential learning theory (see Figure 1), developed from Dirkx and Prenger (1997), Knapp (1992), and Kolb (1984). Experiential learning theory includes a multidimensional approach to teaching and learning (Knapp, 1992). Central to developing understanding is the learner’s concrete experience. Providing experience through real-world cases is one way that educators can apply experiential learning theory to the use of cases. Adult learning theory supports the use of active learning strategies in which students engage in highly relevant life experiences (Dirkx & Prenger, 1997). Thus, theory supports the use of direct interaction with diverse professionals as part of the case study. Adults utilize these experiences to construct meaning that provides relevance for future life contexts (Dirkx & Prenger, 1997).

Structure of the Course

The uniqueness of the first-year learning experience and the need for active-learning settings to stimulate critical thinking initiated the development of our Introduction to Fisheries and Wildlife course (FW 100). Students are expected to achieve the following course outcomes: Apply the scientific bases of management, identify the career possibilities of the profession, develop key skills, and begin a professional development process. Although all fisheries and wildlife majors must take the course, fisheries and wildlife majors rarely comprise more than one third of the class. The 3-credit course is taught in both fall and spring terms, with students attending two 50-minute lectures and one 2-hour lab on a weekly basis. In the fall, class sizes range from 60-75 students, while in the spring, class sizes range from 30-50 students. Lab sections are limited to 25 students. Although the course is targeted for first-year students, there are also sophomores and juniors enrolled. Because the course is required for fisheries and wildlife majors, sophomores and juniors who change majors, as well as transfer students from other academic institutions who are considering the major, also take the course. Transfer students usually comprise roughly 60% of the approximately 50 incoming majors each year.
Experiential Learning Cycle as Applied to Case Studies

- **Experience**
  - Lab simulation/discussion of case studies
  - Contact with real-world issues and professionals

- **Reflection**
  - Reflective writing
  - Perceptions of science, management
  - Personal meanings

- **Application**
  - To personal career goals
  - To personal view of learning processes
  - To next cases, to work/career
  - In exam context

Case Study Format

Active-learning strategies involve problem solving, discussion teaching, small groups, cooperative learning, case studies, and simulation (Myers & Jones, 1993). All of these components appear interdependently throughout the case studies used in the course. The learning objective of the case studies is for students to learn and apply the management cycle as a consistent framework for resource management analysis (Krueger & Decker, 1999). The management cycle focuses on five decision-making processes: problem identification, goal setting, action development, evaluation, and information generation (see Figure 2). The three case studies used in the course represent three different topics and problem types.
that fisheries and wildlife professionals address. The cases increase in complexity as the semester progresses to accommodate students’ learning transitions (Grossman, 1994).

In the first case study, students tackle how a disease called bovine tuberculosis spreads among deer and cattle. The case focuses students’ attention on regulating a well-known harvested species and dealing with population density. The second, slightly more complex case involves developing recovery plans for an endangered species that is not harvested for commercial or recreational purposes, either the Kirtland’s warbler (an endangered migratory songbird) or the gray wolf. Finally, students address the complex issue of mercury contamination in aquatic ecosystems. This case introduces global societal issues that are more complicated than those in the first two cases.

Table 1 describes how the cases differ slightly from each other in their design and foci.
<table>
<thead>
<tr>
<th>Case Study Complexity</th>
<th>Featured Species</th>
<th>Featured Problem/Issue</th>
<th>Biological Level of Organization</th>
<th>Focus Within the Management Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>White-tailed deer</td>
<td>Overabundance; disease; social issues</td>
<td>Organismal population</td>
<td>Identify problem; information needs</td>
</tr>
<tr>
<td>Moderate</td>
<td>Kirtland’s warbler</td>
<td>Endangered species; forestry and burning as management tools; recovery planning</td>
<td>Community</td>
<td>Objective is given; identify problem; action for management</td>
</tr>
<tr>
<td>Complex</td>
<td>Mercury in the environment</td>
<td>Organisms, ecosystems and humans; complex ecosystem processes; values; impacts of consumer products</td>
<td>Ecosystem</td>
<td>All steps interconnected</td>
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</table>
Case Study Sequence

Each case study utilizes a similar sequence of connected and overlapping learning exercises (see Table 2) over a five-week period. Guest speakers and laboratory exercises provide the key active-learning features that breathe life into the case study approach. Working individually, students first encounter the case study through the course Web page, which contains a few guiding questions and links to information about the case. After reviewing the information, students answer a homework question and submit two questions that they would like upcoming guest speakers to address. The instructor categorizes the questions and sends them to the guest speakers prior to their presentations. The speakers then craft their class presentations in response to the students’ questions.

Following the speaker presentations, student groups engage in a two-hour lab simulation and discussion regarding the case study. This group engagement simulates real, multidisciplinary approaches to problem solving commonly used in the applied sciences, such as resource management. The case study concludes with reflective writing that is used to provide authentic assessment of students’ thought processes and to help students develop metacognitive perspectives on their own learning processes. Assessment of students’ reflections provides insight into the extent that the case study addresses the stated outcomes. The reflections serve as formative assessment that enables the instructor to tailor aspects of the course to each new group of students every semester. Later, students’ understanding and ability to synthesize their case study experiences is evaluated through a written exam.

Using guest speakers and Web site information as a basis for the case study allows students and instructors to become co-learners. Such an approach shifts the focus from teacher to learner (Barr & Tagg, 1995) by enabling students to “construct, discover, transform, and extend their own knowledge” (Smith & Waller, 1997, p. 272) instead of serving as a “passive vessel to be filled by faculty’s knowledge” (Smith & Waller, 1997, p. 275).

Web Site

The course Web site contains links to relevant material, such as the key state or federal management agencies involved in the case study, as well as relevant newspaper articles and press releases. Providing Web links enables students to encounter the material in various formats and facilitates their pursuit of further knowledge beyond that required for
the case study if they desire. The study guide questions ask students to relate the Web material to various aspects of the management cycle. Students search the material to identify the key management problem, to ascertain the desired goal, to determine the kinds of management actions ongoing, and to evaluate the level of success those actions engender.

Guest Speakers

Guest speakers share their real-world management experiences with students. Speakers provide information about the case study, share stories about their personal career backgrounds, and spotlight information about current job or internship possibilities. Guest speakers represent federal and state governmental agencies, non-governmental organizations, and university researchers.

Lab Simulations

The 2-hour laboratory period for each case study builds upon the information students have gleaned from the course Web site and guest speakers and provides the setting for problem-based learning to occur. Students simulate various management agency situations or go into the field to learn to collect relevant data. A detailed example of one of the case exercises below illustrates the typical format.

During the initial deer case study, students assume the role of Department of Natural Resources Wildlife Division employees divided into four working groups: habitat management, human dimensions, deer population management, and organismal biology. Keeping in mind that the management objective for white-tailed deer in Michigan is to reduce deer populations, the students must glean enough information from guest

<table>
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<th>Table 2</th>
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<tbody>
<tr>
<td><strong>Case Study Standard Sequence Used in All Three Cases</strong></td>
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<tr>
<td><strong>Week 1:</strong> Web page and question generation/homework</td>
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<tr>
<td><strong>Week 2:</strong> Questions summarized, sent to speakers; Speakers contacted by students</td>
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<tr>
<td><strong>Week 3:</strong> Speaker presentation (3)</td>
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<td><strong>Week 4:</strong> Lab exercise</td>
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<td><strong>Week 5:</strong> Reflective writing/exam</td>
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speak mathematics to clearly define the problem(s) posed by Bovine TB in Michigan’s white-tailed deer. Students must then make recommendations to guide the DNR Wildlife Division in allocating resources (financial, time, personnel, and the like) to address the problem of Bovine TB. At the end of the period, each group produces a list of recommendations and presents it to the entire lab section. They then turn in their list along with the names of each group member. Turning in the list of recommendations addresses the concern that some students leave case study discussions frustrated because they have not produced a tangible product (Herreid, 2001). Similar lab exercises enhance understanding of the two other case studies as well.

Reflective Writing

Upon completion of the lab simulation, students respond to four reflective questions:

- What did you learn about fisheries and wildlife in general?
- What did you learn about the case study specifically?
- What did you enjoy most about the case study?
- About what aspect of the case study would you like to learn more?

These questions encourage students to focus on their own learning in contrast to asking them to provide specific examples of the management cycle that the instructor desires. The questions stimulate students not only to develop critical-thinking skills such as synthesis, but also to raise their awareness of their own development and interests.

Results

This section outlines the results of students’ responses to the learning activities integrated within the case studies. Their responses address the Web site, the guest speakers, the lab simulations, and reflective writing as they appear in the case study sequence (Table 2).

Course Web Site

The course Web site provides the bulk of the background information students need for the case studies. This reduces the amount of material
that speakers and instructors need to present and provides students long-
term access to materials. The Web site also electronically archives
materials from the guest speakers’ presentations. In their midterm course
evaluations, students responded with comments such as the following
regarding what they liked about the course:

[I liked] putting the guest lectures on the Web because then I
can just listen and soak up the info [sic] better.

I still love the guest speakers. The Web site is great. I like read-
ing about the speakers and being able to review the
presentations.

Guest Speakers

Guest speakers consistently remain a highly regarded aspect of FW
100. In response to the question “What is working?” 19% of students in
the spring 2000 course listed guest speakers, followed by case studies
(13%), the course Web site (13%), and other cooperative learning activi-
ties (10%) (see Table 3). In spring 2001, the course was changed to require
a team of students to host each guest speaker. This change resulted from
an interest in building more student ownership into the course and pro-
viding a more personal experience for students and speakers. Students
now contact the guest speaker they are assigned to host one week prior
to the class to arrange for the speaker’s audiovisual needs and to share
questions or issues with the speaker. At the guest speaker’s presenta-
tion, students introduce the speaker to their classmates, facilitate
questions during the presentation, and thank the speaker at the conclu-
sion. In response to the question “What is working?” 37% of students in
the spring 2001 course listed guest speakers, followed by cooperative
learning (24%), course Web site (14%), and case studies (14%) (Table 3).
A sample of students’ comments follows:

What is working is the guest speakers for each case study. I
feel that I have learned a lot more about the two case studies
so far due to the presentations than what I may have without
them.

[What works is] having guest speakers to help understand case
studies and to give different perspectives.

I enjoy the setup of the lab and the group work involved. The
class gives us a lot of exposure to several different aspects of
the case studies, allowing us to meet individuals who actually
have a hand in it.
Small-group stewardship of guest speakers received mixed results. Not every group took the initiative to contact the speaker enough ahead of time to interact beforehand. Some groups forgot which week they were responsible for hosting. In some groups, only one person took responsibility for contacting and introducing the speakers. However, the following e-mail message shows that some students took both their individual responsibility and their responsibility to the group quite seriously:

I am sorry to say that I will not be able to attend class tomorrow due to a family emergency. I talked to [the other group member], and he will introduce [the guest speaker] tomorrow for our group. Hopefully the notes will be on the Web, but if not I will get them from someone in class. Thanks for understanding.

This message provides evidence for the success of peer-group as well as Web-based support for student learning. It also reveals the positive interdependence and individual accountability that cooperative learning requires.

Table 3

<table>
<thead>
<tr>
<th>Component</th>
<th>Spring 2000 Rated Favorable (%)</th>
<th>Spring 2001 Rated Favorable (%)</th>
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</thead>
<tbody>
<tr>
<td>Guest speakers</td>
<td>19%</td>
<td>31%</td>
</tr>
<tr>
<td>Group work</td>
<td>10%</td>
<td>24%</td>
</tr>
<tr>
<td>Case study</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>Web site</td>
<td>13%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Lab Simulations

During the deer case study in spring 2001, students gathered in six heterogeneous four-member groups, with each group member representing a certain topic. A guest speaker provided a brief introduction and then worked with students as they discussed the written material assigned. Each group of students then ranked the four topic areas—population dynamics, organismal biology, human dimensions, and habitat—based on their perceived importance. All groups’ rankings were placed on the board, and each group presented and defended its
rankings. Finally, the entire lab section discussed the rankings. Five of the six groups selected population dynamics as the priority area, with the remaining group choosing organismal biology. The different views among groups highlights the message that case studies do not provide singular answers to complex problems, but instead assist students in compiling, analyzing, and evaluating multiple approaches.

**Reflective Writing**

Student responses suggest that the case study format met the stated outcomes of the course. Students demonstrated comprehension of the management cycle and the scientific basis for management, recognized key skills required for the profession, and linked the exercise to personal career aspirations. For example, regarding the scientific basis for management, one student wrote,

I learned that fisheries and wildlife management deals with many perspectives in this case. Problems of overpopulation and feeding piles have to be addressed, and the people have to be well informed of the problem so they will cooperate and work together to solve it.

Another student demonstrated a recognition of key skills required for the profession:

I learned that fisheries and wildlife management requires very good persuasive skills. I know it may seem like it should not have been a surprise, but I didn’t fully recognize this until I was faced with the challenge of persuading people to believe in my cause. I learned how very important communication skills are in succeeding in this field.

This student linked the course to career aspirations:

The fact that I was able to get into it and have good arguments instantly made me think I’m probably doing the right thing by going into environmental law.

In addition to meeting specific course outcomes, the case study format also facilitated achieving social outcomes critical to ensure successful transition and networking for first-year students. Regarding what they enjoyed most about the deer case study, students said the following:

I loved how the entire lab got into the whole thing. I think that the entire class was a lot more social and actually got to know each other a lot more.
I liked that we learned about the different groups that are involved with TB management and that we got to in a way experience what it would be like in a true case study meeting.

I wouldn’t mind doing another case study because you learn a lot about the topic and it becomes a real issue instead of just a lecture.

These comments highlight how the case study format builds awareness of the rationale for the entire curriculum by providing students with a glimpse of the skills and knowledge required to succeed after graduation. In addition, the comments illustrate how case studies can be effective in helping students in introductory courses develop self-reflective skills and metacognitive awareness and come to a better understanding of their own lifetime learning processes.

**Discussion**

**Guest Speakers**

Guest speakers enjoy getting specific pre-visit guidance directly from students regarding their presentation so that they know the level and depth at which to target it. Students, in turn, receive information that better addresses their concerns regarding the case. Speakers often come with a list of specific student-generated questions to discuss with students. However, the guest speaker stewardship role requires substantial faculty effort to facilitate and sustain. In making the transition from high school to college, first-year students often are not comfortable with the responsibility and opportunity for directing their own learning. Some students are intimidated by contacting professionals via e-mail or phone to discuss an upcoming presentation. To improve student engagement, the instructor should state clearly the expectations of their speaker stewardship role and, if possible, assign specific grade requirements. Integrating guest speakers into the 2-hour lab period provides more time to generate a meaningful, focused discussion than does a 50-minute lecture period. In the lab, students engage in small-group analysis of the case, develop management alternatives, and then share those with the guest speaker to receive real-world feedback.

**Course Web Site**

Online assignments work best when given no earlier than two weeks into the term to ensure that students have set up their e-mail accounts.
and gained some facility with the Internet. However, requiring students to submit questions for guest speakers spurs them to engage the online material in a timely manner. Web site additions in future courses will include an online bulletin board to facilitate structured controversy discussions as well as provide a space for student-added informational links.

**Lab Simulations**

Although it provides three separate yet linked opportunities to practice problem-solving that assists students in developing key skills, the lab structure needs variety in order to maintain student interest. Students detect and reject familiar formats and processes as “boring,” even when the specific content changes. Students welcomed the change from a simulation exercise to a field-oriented data collection exercise for the final case study. To stimulate interest in the case studies, students who registered early for the fall 2001 course were sent an e-mail in spring 2001 asking them to vote for the three case studies they most preferred out of seven possibilities. Soliciting such input before students even attend their first class seeks to demonstrate that they can influence their own learning journeys.

**Limitations**

Students seemed to identify more with individual components of the case studies—guest speakers, Web sites, cooperative learning—than with the case studies themselves (Table 3). Despite course changes that resulted in higher ratings of guest speakers and group work, students’ overall rating of the case studies themselves did not change. Perhaps this is due to students’ lack of interest in the overall topic of the case studies. Allowing students greater say in the case study topic might improve course ratings. The challenge remains finding the time to poll students and prepare case study materials within the course of a semester.

One way to improve students’ ratings of the case studies might be to have them pick from a list of possible case studies for which materials and guest speakers have already been identified. Another possible solution is to develop the case studies within the semester itself and allow students the freedom to pursue the topics that most interest them. Such a student-centered approach negates the need for instructor-prepared materials and ensures topics that interest students most. A third option blends the first two options. An instructor provides the structure for all of the case studies through the use of the management cycle (Figure 2).
He or she then illustrates the use of the management cycle through a structured case study. Students then develop and write a case study that interests them following the example provided by the instructor. As part of this option, students would establish a list of guest speakers to invite, develop Web site links, and collect peer-reviewed as well as lay references to support their chosen cases. The student-constructed cases would provide the topics for the lab simulations. This student-centered approach, following a constructivist pedagogy, further develops the critical thinking required in natural resources professions (Ryan & Campa, 2000) by having students conduct their own data gathering, analysis, and application to new scenarios.

Conclusions

A holistic course approach using three increasingly complex case studies in both lecture and laboratory format has proved to foster active learning and critical thinking in an introductory fisheries and wildlife class. The case studies fulfill the course objectives that students understand the scientific bases of management, understand the career possibilities of the profession, develop key skills, and begin the professional development process. A holistic approach indicates strong interdependence and overlap among case study components. Using only one of the course components—guest speakers, the Web site, lab simulations, reflective writing—or viewing each component as an independent entity within a sequence reduces learning overall effectiveness. Thus, guest speakers are incorporated into the Web site, class presentations, lab simulations, and exams. The Web site provides information on guest speakers’ presentations, information required for the lab simulations, and a description of the rubric used to assess learning through exams. This approach also assumes the interdependence of content, process, and critical-thinking outcomes. Success in natural resource management requires competency in all of these outcomes. One student summed this up as follows:

What I liked about this case study was how it demonstrated that all aspects of management are interrelated. This means that in order for one to manage properly and efficiently, one must have an overall comprehension of the factors involved.

The comprehension skills that this student refers to build a strong foundation for introductory students as they begin their academic journey. Learning to recognize interrelationships and the importance of multiple
factors provides students with a rationale for the breadth of courses the curriculum requires.

Experiential learning theory promotes viewing learning as a set of spiraling phases rather than as a “flat” process. The use of the management cycle for teaching three increasingly complex case studies represents such an experiential approach. Each new experience encourages learners to engage in activities that help them seek further experiences and reflective opportunities. This exploration, in turn, leads learners to consider what else they might do in the ever-cycling spirals of their learning journeys. Case studies can help facilitate this process by building upon each other with increasing layers of complexity throughout a semester. The case studies collectively can help generate what some teacher-scholars call “learning that lasts.” This process helps learners develop a deep understanding of content, contributes to their personal development, fosters their effective performance in professional settings, engages them in productive social and civic roles, and fosters learning processes throughout their lifetimes (Mentkowski & Associates, 2000).

Although students’ rating of the case studies themselves did not improve with this active-learning approach, it is clear that students enjoy the active-learning components of the case studies. They enjoy interacting with the guest speakers as real people who deal with current problems that frequently occur in the profession. The guest speakers and course Web site breathe life into the course by shifting the case studies from merely academic exercises to events that students may actually encounter. As many teacher-scholars have suggested, one of the strengths of case studies is their ability to engage students. We hope that students coming out of our introductory class are engaged and that they begin to understand the scientific knowledge, complexity of issues, and skills required to succeed in their academic and professional careers.

We believe the following student quotation appropriately summarizes our experiences with using case studies:

One thing that I also didn’t ever think about is how many stakeholders there have been for these case studies. I always thought of fisheries and wildlife problems affecting basically fisherman, hunters, farmers, [and] rural people. And I thought that it was an indicator of bigger problems that may occur. Man, was I being narrow-minded. Looking back, I can see how my frame of mind and outlook on [fisheries and wildlife] management has changed, and overall I feel very informed. Thank you for a great semester.
References


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