

## A Taste of Teaching

Many undergraduate students in the sciences go on to obtain M.S. and/or Ph.D. degrees, because it is part of their long-term goals (e.g., they want to be a professor or obtain another position requiring a graduate degree) or because they are pushed that way, receiving advice that a graduate degree will be necessary for any career advancement. Many of the graduate students in the sciences, including wildlife science, serve as teaching assistants to obtain part or all of the funding for their graduate education. Many of these students are unaware that they will be serving as a teaching assistant and have little experience and expectations regarding instruction or being a teaching assistant.

To better prepare prospective graduate students for the possibility of teaching and provide an experience allowing them to make a more informed decision as to whether they want to teach in the future, we developed an undergraduate student teaching assistant program. This program provides undergraduates with information on teaching, a “taste” of the teaching experience, and an opportunity to interact with instructors during the design of class activities and assignments. During the past 6 years, 14 students have been involved with our program entitled Teaching Wildlife. Students in the program serve as teaching assistants in a junior-level, Wildlife Ecology and Management course, which typically contains 100 to 150 students. The only prerequisite is that they have successfully completed the course. Students can participate in Teaching Wildlife as a one-credit, graded course or as an extracurricular voluntary program. In either case, students read several papers on pedagogy, including one dealing specifically with teaching courses in wildlife science; meet regularly with us to discuss the readings, instructional methods in general, and the instruction of the specific course they are assisting with; assist us with the development of assignments, including problem sets and other homework, term papers, quizzes, and exams; work with graduate teaching assistants and us on grading assignments; attend all class meetings; and keep a journal detailing how the content and delivery of the course can be improved in the future. Additionally, we work with each student to develop and deliver at least one 15 to 30 minute lecture, including associated assignments and discussions. Students choose a topic from a set of predetermined major concepts or issues for the course. For each topic, we provide the minimum content to be covered, but they can add more. We provide undergraduate assistants feedback on their lecture and presentation and suggestions for

improvement, and they received similar feedback from the graduate teaching assistants and students enrolled in the course they are assisting.

At the end of each semester, we meet with the undergraduates who participated in Teaching Wildlife to get feedback on the course, and to review their observations, encourage suggestions, and enable them to synthesize their reflections on their experience as an assistant. In a few cases, we have been able to speak to students who participated in the program and are now in graduate school. All feedback from students from Teaching Wildlife has been positive. After completing Teaching Wildlife, several students determined that teaching was not something they wanted to do and adjusted their career path accordingly. Others, who had not intended to go to graduate school or become teachers, concluded that teaching was a strength and are now following that career path. And, several, including two who became graduate teaching assistants, reported that their undergraduate experience in Teaching Wildlife prepared them for their current roles as graduate teaching assistants and gave them a “leg up” on the other graduate students.

Several specific experiences from Teaching Wildlife may be particularly noteworthy and of benefit to other instructors: 1) participating students were unaware of the challenges of designing high-quality course assignments, particularly exams, and reported an increased awareness of how other instructors develop courses and assignments; 2) most students gained an appreciation for and skill in public speaking, effective teaching, and “handling” a relatively large class, and as one student put it, “experiencing and overcoming the terror of being in front of that many people;” 3) the students enrolled in the course in which these undergraduates assisted indicated that they did not feel the addition of the undergraduate teaching assistants was detrimental to their learning experience and the overall class, and in some cases thought it enhanced their experience and piqued their interest in teaching; and 4) it has provided us with tremendous feedback from students who have taken the Wildlife Ecology and Management course and then observed it a second time from an instructor's point of view, which has allowed us to significantly improve course content and delivery (e.g., we have added new and enhanced old content to more clearly illustrate the relevance and value of certain homework and reading assignments, and more clearly linked the various topics covered during the course).

We believe Teaching Wildlife illustrates the benefits of such undergraduate experiences to the

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participating students and the course itself, and promote the development of similar programs in the sciences elsewhere. In the case of our program, we are working to expand it to more students and additional courses. We would appreciate suggestions for improving Teaching Wildlife from other instructors.

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## From Business to Government to Schools, Wind Power is Creating New Opportunity

Wind power, long used on farms for tasks such as pumping water, is finally moving to the big city. The renewable resource, which is being used to aerate ponds and generate electricity, is producing surprising savings, ROI, and opportunity for a wide range of city folk – from businesses like John Deere dealers; to cities like Montpelier, ID; to schools like Sault College in Ontario, Canada and Autry Technology Center in Enid, OK.

Wind energy is the fastest growing source of electricity in the world. In the United States, a record 2,431 MW of wind power was installed in 2005, capable of producing enough electricity to power 650,000 typical homes. Resource assessments have found that the windy areas (class three and above) in the United States—if fully developed—could supply more than four times the nation's current electricity needs.

### Empowering Business

A growing number of businesses are looking to wind power not only to offset rising power costs, but also to present a “green” marketing advantage. State-of-the-art technology improvements have convinced many that now is the time to act.

For the first time, the technology is designed for commercial farms or businesses on the electric grid, not just remote off-grid sites. Unlike traditional windmills requiring a complex DC to AC power inverter prone to breakdown, grid-compatible technology like Endurance's can provide up to 30% more power and greater reliability.

Van Houweling, Perry, Iowa, has installed an S-Series wind turbine by Endurance Wind Power. The unit is capable of producing up to 20,000 kWh per year, about 20% of the site's needed power. A larger unit capable of producing over 200,000 kWh per year is scheduled to produce about 85% of the power needed at his upcoming west Des Moines, Iowa site.

The renewable power provided by the wind turbine, along with other measures taken, helped the new BTI-Greensburg facility become the world's first LEED Platinum John Deere facility. LEED (Leadership in Energy and Environmental Design) is the U.S. Green Building Council's highest certification for sustainable design.

A number of features help users get the most out of the next generation technology: controls and electronics at ground level; a high wind sensor and dual disc brakes that automatically stop and release the rotors when appropriate; and remote monitoring and control of a turbine operation via a wireless interface.

### Empowering Government

While the U.S. Department of Energy's “20% Wind Energy by 2030” report examines the feasibility of using wind energy to generate 20% of the nation's electricity demand by that date, current policies are of more immediate help to those looking at wind power.

As of March 2009, the federal government offers an investment tax credit for the purchase and installation of qualifying small wind electric systems, worth 30% of the value of the system, according to the U.S. Department of Energy Wind & Hydropower Technologies Program website.

### Empowering Schools

As schools and communities face volatile energy costs, tight budgets, and a growing need for good jobs, some are harnessing wind power to generate energy and opportunity.

For instance, when Sault College recently installed a 35 kW Endurance wind turbine on-campus, they were the first college in Ontario, Canada to power their Student Life Center using renewable energy, while offering exciting hands-on learning opportunities.

As a learning tool, the turbine is its own classroom. Ironworker apprentices lower the tower as required; civil engineering technicians inspect the tower annually; and mechanical and electrical students learn how to maintain the turbine. Even the process automation students get involved, creating a system to analyze data and show how much power the turbine is producing.

“Because the turbine is essentially a scaled down version of large megawatt units, students get practical hands-on experience they can't get from a book,” says Colin Kirkwood, Dean of Sault College's School of the Natural Environment, Technology and Skilled Trades. “Companies with wind turbines have already hired our graduates, and visiting international executives say they're looking for this type of skill set in new hires.”

Sault College students are now working on a web-based control system interface that will make the wind turbine a learning tool for the wider community, according to Kirkwood.

“The goal is for prospective students, community members, even elementary, middle, and high school students to track our power generation and carbon credits via our website,” explains Kirkwood. “More interactivity means more involvement.”

The college's Applied Research Center will also offer applied research with the turbine to companies looking to enter the wind energy market.

"The turbine underlines our commitment to build a better environment," says Trevor Rising, P.Eng, Sault College's Supervisor of Maintenance and Construction. "It not only changed our skyline, it changed our way of thinking."

U.S. schools and technology centers are also taking advantage of wind-powered opportunities.

For instance, Autry Technology Center in Enid, OK, one of the five original technology centers in the state, selected a Model S-250 wind turbine by Endurance Wind Power.

"We chose the Endurance turbine as an economical opportunity to start generating our own power and provide students an actual working model for educational purposes," says Dr. Marcie Mack, Assistant Superintendent of Autry, which is part of the Oklahoma Career and Technology Education system which includes 29 technology centers with over 55 campuses and various programs within Oklahoma high schools.

With Autry's current Mechatronics program, the school teaches the fundamentals of topics such as pneumatics, fluid power, motor controls, industrial electricity, and programmable logic controllers. For students who want to go beyond the fundamentals and specialize as a wind technician, the school collaborates with other technology centers to help them achieve their career goals.

The wind turbine, which is about 126 feet tall and weighs 650 lbs., once generated 720 kilowatt hours in a two-week period, and generates an average of about 1100 kilowatt hours of power for school use each month.

"The wind turbine creates an awareness of the wind industry in our community," says Mack. "Other benefits to our facility are its safety features, quiet mode of operation, and its ability to connect directly to our power source."

While much is said about wind power's potential to produce clean, abundant energy without greenhouse gas emissions, in the near future more will be said about its ability to generate savings, jobs, and opportunity.

For more information about wind-powered energy, visit <http://www.endurancewindpower.com/>.

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## Structured Feedback: A Tool for Teaching and Learning

A three-fold approach to teaching based on learning (new knowledge acquisition); application (transferring that new knowledge to real life situations/settings), and; reflection (refining and adjust-

ing content and delivery) is very important for teachers to prepare students in the emerging global society. This three-fold approach also offers a unique setting for learners to attain the knowledge and skills needed for higher order learning and thinking. In the following paragraphs, we describe a strategy, "Structured Feedback" that we have used in our efforts to improve teaching and learning at the undergraduate level. First, we define the strategy and describe the process used to implement the strategy. Second, we present results of its use in two courses and comment on student and teacher perspectives on the use of this teaching strategy.

Structured Feedback is a mid-semester learning/assessment tool designed to provide feedback to students and for the instructor to adjust teaching during the course of the semester. In Structured Feedback, students respond to their level of confidence in learning (or not learning) the content/topics presented in class (see Figure 1). Each student in class is provided with a Structured Feedback form to indicate their perceived level of confidence on the topics/concepts discussed in class. The form is divided into two sections. Section one contains the course # and title, space for writing student name, date, and lists topic/concepts discussed in class. Section two contains two boxed areas for students' responses. Students write the topics/concepts with which they are confident in the "upper" box, and write topics/concepts with which they are not confident in the "lower" box (see Figure 1).

AEE 496A  
Introduction to Research Methods - First Quarter Assessment

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Topic: UNIT I - Research Foundations

Characteristics of Research	Research designs
Components of a Research study	Types of research
Scientific Reasoning	Conceptual and Theoretical frameworks
Variables and levels of variables	
Hypotheses	
Definitions	

Of all the topics discussed so far in Unit I, identify the topics you feel confident you learned something or clear to you. Just identify the topics.

- *Characteristics of research*
- *Components of a research study*
- *Scientific reasoning*
- *Variables and levels of variables*
- *Hypotheses*
- *Definitions*
- *Research designs*
- *Types of research*

Of all the topics discussed so far in Unit I, identify the topics you feel not confident or unclear to you. Just identify the topics.

- *Conceptual and theoretical frameworks*
-

Figure 1: Structure Feedback Form

The instructor gathers the Structured Feedback responses from each student and summarizes the responses to determine which topics or concepts students are confident and comfortable with and which topics or concepts students had difficulty understanding or need emphasis or reinforcement. An example summary of responses of all students are



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recorded in a matrix table format (Figure 2) where the concepts/topics are listed on the left column of the matrix table while the student identification numbers are listed on the top row of the matrix table. As feedback, each student receives an individual Structured Feedback sheet and summary of responses (matrix table) for the entire class. Responses from left to right in the matrix table (Figure 2) reflects the overall response for the entire class, while the responses from top to bottom reflect individual student feedback.

The matrix table helps the instructor to make adjustments for the entire class as well as attention to individual students in the class. For example, as shown in Figure 2, student # S3 needs emphasis in three of the topics, while the overall class needs reinforcement on topics such as conceptual/theoretical frameworks, and research classification topics. Other ways the matrix table can help the instructor include: 1) reemphasizing a particular topic or concept, 2) changing and/or adapting teaching style, 3) giving additional examples to clarify, and 4) meeting with individual students requiring further assistance.

AEE 496A – Introduction to Research Methods  
Spring Semester 2009  
Structured Feedback Assessment Strategy Summary for Unit I – Research Foundations

Unit I – Research Foundations / Topics	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Total
Characteristics of Research	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	10/10
Research Process	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	21/10
Scientific Reasoning (LET Model)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
Variables, classification, and levels	✓	✗	✓	✓	✓	✓?	✓	✓	✗	✓	21/10
Hypotheses and types	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
Operational definitions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
Review of Literature	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
Conceptual/theoretical frameworks	✓	✓	✗	✓	✓	✓	✗	✗	✓	✗	9/10
Research classifications based on primary objective, nature of data, and time	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	21/10
Basic vs. Applied	✗	✗	✓	✗	✓	✓	✓	✓	✗	✓	5/10
Qualitative vs. Quantitative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
Cross-sectional vs. longitudinal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10
End Sought from each type of research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10/10

**Figure 2: Summary Sheet (Matrix Table) for Structured Feedback Responses**

We have used this strategy in two different courses at the undergraduate level. Student reactions have been very positive and almost all students agree that this teaching strategy helped clarify doubts they had about certain concepts/topics. Overall, students

agreed that this strategy helped them identify where they need further help or reinforcement on key concepts discussed in class. Select student comments included:

“I really liked this because I can ask the teacher to help in a systematic way.”

“One way of showing that the whole class or very few students understood the concepts taught in class.”

From the instructor perspective, this strategy has helped to re-examine and re-evaluate time spent on a topic and corresponding evaluations. Further, the use of this strategy helped refine teaching skills, provided mechanisms to deliver feedback to students on a regular basis, and gave confidence that the students are learning as evidenced by performance and participation. From the students' perspective, students realize that they are responsible for content if they missed class. Structured Feedback is a valuable tool for both teacher and students in terms of reinforcing key concepts; in preparing or reviewing for exams; in changing teaching style or strategy; and making mid-semester adjustments.

The Structured Feedback strategy may not be applicable as defined in the setting of a large class because of its inherent time/effort requirements. However, creative use of instructional technology may address this limitation. Also, providing timely and frequent feedback to students is critically important for this strategy to be successfully implemented and to be of value to students and the instructor. As we try to improve this strategy further, we plan to explore: 1) how to capture or account for higher level learning objectives, 2) the amount of time spent on each topic and corresponding feedback, 3) other assignments to show linkages to learning objectives, and 4) linkages to test performance.

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