1999 ACUBE Meeting Abstracts

PRE-MEETING FIELD TRIP

The Natural and Not-so-Natural History of the Kinnickinnic River Watershed Field Trip. Clarke Garry, University of Wisconsin-River Falls, clarke.garry@uwrf.edu

This half-day field trip will feature notable physical and biological characteristics of the Kinnickinnic River Watershed. The Kinni, as it is locally and affectionately known, is valued by residents and visitors for its scenic beauty, canoeable water, and naturally-reproducing trout populations. The watershed, however, holds much more for the careful observer. The natural history of the valley will be sampled through a multi-stop, field trip approach. Sites will include: 1) the Kelly Spring area, one example of the many source springs of the Kinni, 2) Parker Creek, scene of a recent "accidental" fish-kill event, 3) observations on urbanization of the Kinni within River Falls (and the adjacent Foster Prairie restoration site), 4) the South Fork waterfall, and 5) the delta at the confluence of the Kinni with the St. Croix River. Emphasis will be on stream valley ecology and the impact of humans on a cold water resource. Space is limited to 14 participants; hiking is necessary; guidebook provided.

CONCURRENT WORKSHOP SESSIONS I

Accessing and Analyzing Student-generated Data: Integrating Process and Content via the WWW. Buzz Hoagland, Biology Department, 577 Western Ave., Westfield State College, Westfield MA 01086-1630, bhoagland@wsc.mass.edu

A paradigm shift from the student as a passive recipient of facts to the student as an active-learner and problem-solver is occurring in science education. New teaching tools such as computer simulations and the WWW are facilitating these changes. Computer simulations provide students with sufficient data for meaningful analysis. Unfortunately, the diversity of simulation programs is limited, and students can feel isolated from the experiment. An alternative to computer-generated data is the data collected from wet labs. Students in many college and university biology courses conduct similar if not identical laboratory experiments each semester. These data also suffer because frequently they are too few to allow rigorous analysis. This problem can be overcome through asynchronous WWW collaboration. Posting experimental procedures and the resulting student-generated data solves a number of problems. Firstly, archived data can be added to current data to allow for larger data sets. Secondly, archived data can be used for comparisons. And thirdly, students can compare their data with other student-generated data instead of textbook examples. This workshop engages the participants in the process of accessing student-collected data from the web and subsequent analysis of these data. The major objective of this workshop is to recruit faculty into the process of posting student-generated data on the WWW.

Using Family-level Biotic Indexing as a Lab Experience with Applicability in Local Environmental Assessment I and II. Clarke Garry, University of Wisconsin-River Falls, clarke.garry@uwrf.edu

Family-level biotic indexing as described by Hilsenhoff (1988) is a practical way for undergraduate students to effectively document the impact of organic pollution on a local stream or streams. In contrast to traditional biotic indexing, in which arthropod specimens must be identified to the species level, the FBI requires identification only to family. With the use of pictorial keys students can identify specimens with reasonable effort to the family level. In preparation for the field work, student teams make decisions on a sampling strategy. Each collects a specified number of arthropod specimens from a selected location in the stream(s). The teams return to the lab to identify families, count specimens, and complete calculations of the index value. The only specialized materials necessary are aquatic collecting nets and appropriate identification keys. This workshop will engage participants in the field and lab portions of the activity. Some hiking and wading are necessary.

Semester Long Creative Projects: An Educational Instrument for Maximizing Student’s Learning and Understanding of Science and Mathematics. Abour Cherif, Columbia College Chicago, acherif@popmail.colum.edu; Jerry Adams, Columbia College Chicago, gadams@popmail.colum.edu; Stefanos Gialamas, Illinois Institute of Art, gialamas@aai.edu; JoElla Eaglin Siuda, Illinois Institute of Art, MsSiuda@mediaone.net

Teachers often wonder whether conceptual changes have taken place in their students’ understanding of a given subject. The Semester Long Creative Project may be used as an educational instrument to maximize students’ learning and understanding. By engaging students in exploring a particular concept throughout the semester they produce a significant and substantial creative work that reflects their true understanding of that concept through media of their own choosing.

In this presentation we explain the approach, discuss various assessment techniques, and the

Meeting Abstracts  Bioskene  25
underlying philosophy behind developing student semester long creative projects that maximize learning and understanding. Then, we give examples of students' projects from freshman classes in the areas of biology, chemistry and mathematics, and show how students successfully demonstrated their understanding of the concepts. Finally, we share some of our own experiences and techniques that have proven to be effective in helping students produce exceptional final projects.

Service Learning in Biology Courses: Making A Difference in Ecology. Eric Ribbens, Department of Biology, University of Evansville, 1800 Lincoln Avenue, Evansville, IN 47711, er8@evansville.edu

Service learning, in which students learn through the process of engaging in a hands-on experience with direct benefit to the university, the community, or local businesses, is a teaching technique that is rapidly expanding in many American colleges and universities, because it is both viewed positively by many students and increases retention of the knowledge gained during the course. However, typical service learning courses are business, education, or humanities courses. Many biology courses could successfully implement service learning. I will present reasons why service learning is a viable pedagogical technique, describe several courses in which I have utilized service learning, and discuss the advantages and the potential problems associated with incorporating service learning. Finally, we will identify ways in which service learning could be effectively incorporated into courses that the participants teach.

POSTER SESSION I

Developing an Active Learning Animal Behavior Lab. Kathryn L. Anderson, 1600 Taylor Ave., St. Paul, MN 55104, kanderson01@gw.hamline.edu

Research has shown that students learn more effectively through a hands-on interactive approach to biological topics. I have created a lab that engages students in brainstorming research questions, designing an experiment, using statistical test to analyze data, and drawing conclusions concerning data obtained. This lab compares the aggregation behaviors of kin and nonkin groups of Xenopus laevis tadpoles and frogs. Preliminary assessments indicate that students gain confidence in their abilities to design and test an experiment, their interest in biology increases. I will also present additional assessment of the lab's success at the poster session.

How We Killed Our Yeast Cells. Jennifer Conradt, Jaime Kirkpatrick, Kelly Martin, and Brad Mogen, Biology Department, University of Wisconsin-River Falls, 410 S. 3rd St., River Falls, WI 54022-5001

An experiment was performed to determine the effect of various treatments on the growth rate of the eukaryotic microorganism, Saccharomyces cerevisiae. The eight treatments we used included an aerobic (control) and anaerobic environment, along with varying concentrations of the uncoupling reagent, 2,4-dinitrophenol, and the fungicide Amphotericin B. Growth rates were measured by calculating doubling time of the cells in log phase. We found that increasing concentrations of the inhibitor, 2,4-dinitrophenol, decreased the growth rate of yeast cells. Similarly, growth rates also decreased with increasing concentrations of Amphotericin B over the same time period. However, in contrast to 2,4-dinitrophenol, the cells appeared to tolerate sub-lethal dose of Amphotericin B and ultimately resumed a growth rate that was comparable to the control. Surprisingly, anaerobic conditions appeared to have had no negative effect on the growth rate of the cells, and may have enhanced it relative to the control.

Teaching Methods and Logistics of a Marine Ecology Course At Discovery Bay Marine Lab, Jamaica. Robert C. Anderson and Paul Boehlke, Wisconsin Lutheran College, 8800 W. Bluemound Rd., Milwaukee, WI, robert_anderson@wlc.edu

Students at Wisconsin Lutheran College have been learning Marine Ecology during our January break for the past three years at University of West Indies Discovery Bay Marine Lab. The course provides learning opportunities through snorkeling near coral reef, rocky shore investigations, a mangrove swamp tour, and interviewing local residents. Discovery Bay Marine Lab provides housing, meals, lab facilities, and boats. Course learning goals, methods, and logistics will be described.


Call for Participants. The University of Wisconsin System Women and Science Program, with the support of the Division of Undergraduate Education of the National Science Foundation and the Undergraduate Teaching Improvement Council of the UW System, invites participation in a 5-day Institute for curricular reform and development. This is a chance for national and international teams of educators to come together to work with mentors from the Women and Science Program on projects designed to improve science and mathematics education for all students, with an emphasis on addressing issues that often discourage women and minorities from pursuing study in the sciences or mathematics.

Workshop Activities:
- Core group working time, during which teams work on a course development or reform project which they have proposed for their own campus. During this time, teams will work closely with
workshop mentors and other teams with similar projects to incorporate gender- and student-conscious ways of teaching into their proposed course;

- Concurrent sessions on inquiry-based laboratories, women and science, collaborative learning, or other topics;
- Plenary sessions on topics of common interest to the group.

Goals: The mission of the UWS Women and Science Program is to attract and retain more women and minority students in mathematics, science and engineering by promoting systemic change in the ways that science and science education are regarded and carried out within the U/W System. The Institute is a vital part of that mission, and seeks to:

- Help teams return to their campuses with course revisions or newly developed courses that they will implement for their students;
- Provide participants with materials from other team projects, so that each participant will receive useable information for a variety of courses; and
- Provide a time and place for mathematics and science faculty of all levels of expertise to discuss and learn about common areas of interest, and to form networks that extend beyond their own campuses.

Application information is available on the program website at http://www.uwosh.edu/wis/cri.htm. Contact: (920) 424-7414 or melchior@uwosh.edu

CONCURRENT WORKSHOP SESSIONS II

Inquiring Minds Want to Know: Tools and Instructional Strategies to Support Student Inquiry. Ethel Stanley, BioQUEST at Beloit College, stanleye@beloit.edu; Dave Palmer, Caribiner International; Mike Kornely, SMART Technologies

In this workshop we will look at a biological topic (pollinator contribution to the reproductive success of a plant), draw a list of critical variables from the participants experience, introduce a modeling program, collect some data, and evaluate it. In the process, we will also actively explore how instructors build a supportive environment for students to work in. Do we engage our students in question asking and question answering? Do we promote collaborative problem solving? Students develop lifelong learning skills as well as familiarity with the biology in our courses.

We will also be demonstrating the SMART Board, an interactive whiteboard which can be connected to a computer via a video projector. This allows individuals to control computer applications directly from the Board's large, touch-sensitive surface. All whiteboard work - including notes and computer screens - can be saved as files or converted to html for web access.

We are using BeeVisit (Thomson and Thomson 1998), an interactive pollen transfer modeling program (PC) which enables us to observe the relative contributions of different pollinator species to a plant's reproductive success. We can control variables such as expected visits by the different types of "bees", the plant's presentation of pollen through time, the amount of available pollen removed by each visitor, the amount of pollen successfully exported to stigmas, and the survival rate of pollen grains.

We will be changing just two variables- pollen removal and pollen delivery - to create two different "bees":

- BEE #1 whose size or shape produces infrequent contact with stigmas. (Takes away pollen during each visit, but delivers considerably less.)
- BEE #2 that has less contact with anthers than with stigmas. (Takes away less pollen with a good delivery rate.)

We will investigate both "bees" in action and provide support for whether or not we think both bee types actively contribute to the reproductive success of the plant.

Using Family-level Biotic Indexing as a Lab Experience with Applicability in Local Environmental Assessment I and II. Clarke Garry, University of Wisconsin-River Falls, clarke.garry@uwrf.edu

Family-level biotic indexing as described by Hilsenhoff (1988) is a practical way for undergraduate students to effectively document the impact of organic pollution on a local stream or streams. In contrast to traditional biotic indexing, in which arthropod specimens must be identified to the species level, the FBI requires identification only to family. With the use of pictorial keys students can identify specimens with reasonable effort to the family level. In preparation for the field work, student teams make decisions on a sampling strategy. Each collects a specified number of arthropod specimens from a selected location in the stream(s). The teams return to the lab to identify families, count specimens, and complete calculations of the index value. The only specialized materials necessary are aquatic collecting nets and appropriate identification keys. This workshop will engage participants in the field and lab portions of the activity. Some hiking and wading are necessary.

Transformation of E.coli with Bioluminescent Plasmids. Leslie Sutherland, FOTODYNE, Inc., 950 Walnut Ridge Dr. Hartland, WI 53029, fotodyne@aol.com

This introductory, hands-on workshop will introduce the principles of transformation using recombinant plasmids that contain the genes necessary for bioluminescence, the lux operon. Participants will perform a colony transformation technique that is easy, quick and well suited for the classroom. In addition,
they will learn about the lux operon, how it produces bioluminescence, and why several organisms have this special ability. No previous molecular biology experience is necessary. All concepts, techniques, and tools will be introduced and explained in a simple, straightforward manner. Participants will receive a literature package that includes laboratory protocols.

CONCURRENT PAPER SESSIONS I

Concept Building Using PowerPoint® in the Classroom. James Rooney, Department of Natural Sciences and Mathematics, Lincoln University, Jefferson City, MO 65102 rooneyj@lincolnu.edu

Although PowerPoint® presentations are becoming very commonplace in the lecture halls of most college campuses, can we science faculty conclude that such technologies are actually making quantifiable differences in the way that we carry out classroom instruction? All too often, usage of such technology is little more than that of a "glitzy" electronic blackboard! What has this methodology done to the traditional practices of students simply taking notes? Is student performance while using PowerPoint® leading to positive changes in the traditional benchmarks of improved pass/fail rates and exam scores, as well as improvement in critical thinking skills and overall comprehension? What does PowerPoint® offer that would not be possible even with the best usage of a good overhead projector or a blackboard? These are areas of concern we must all investigate if multimedia of this nature is to reach its full potential. On my campus (Lincoln University, Jefferson City, MO) I have converted two courses - Principles of Biology and Human Anatomy and Physiology - entirely into PowerPoint®-based courses. During course development, every attempt has been made to address the above concerns. I will be presenting samples of these two courses, with particular emphasis on examples how interactive concept building with PowerPoint® is a very realistic outcome of this technology that was virtually impossible via more traditional teaching strategies. Also, records of exam scores and pass/fail rates in both courses for several semesters prior to and following the transformation are compared, with data suggesting that this new technology is having quantifiable impact on both. I will assume that those attending do have basic familiarity with PowerPoint®. Also, participants are invited to share their personal experiences relating to the above issues as time permits.

Science as a Process: A Web-Based Timber Wolf Radiotelemetry Lab for Introductory Biology Students. Mark Bergland, University of Wisconsin-River Falls, mark.s.bergland@uwrf.edu

Timber wolf radiotelemetry data can be used to give students a better understanding of the process of science in Introductory Biology laboratories. This presentation will describe how students can analyze radiotelemetry data (downloaded from the International Wolf Center site), then create web-based "posters" of their results for presentation to their peers. The project can also be effectively done using simple materials, without the use of the computer as a presentation tool. Results of class testing at the University of Wisconsin-River Falls will be presented, along with a detailed description of the computer techniques employed. In addition to illustrating the scientific process, the project enables students to gain insight into and appreciation for the complex social system of timber wolves.

CONCURRENT PAPER SESSIONS II

Oceanography Field Course for Missouri High School Teachers: A Report on an Eisenhower Project. Nancy Sanders, Division of Science, Truman State University, Kirkville MO 63501-0828, nsanders@truman.edu

Many biology teachers in the midwest have never had a course in oceanography or marine biology, and fewer have had this experience "hands-on" at the ocean. An Eisenhower Professional Development grant funded a hands-on Oceanography Field Course for 20 Missouri high school biology teachers and 2 STARR teachers. Invitations to apply were mailed to all Missouri high school biology teachers, at public and private schools. Highly qualified teacher participants were selected to represent wide participation of school districts throughout the state - rural and city, inner city, suburb, large and small, and public and private schools. Teachers first visited government, university and public aquarium sites in Florida, then had sailing and shore based activities in the Bahamas. The field course was held for two weeks in August of 1998, with a weekend follow-up session at Truman State University in the fall. The primary goal of the follow-up session was to construct a Web site to facilitate wider sharing of information to any interested teacher (www2.truman.edu/oceanography/).

Community Based Biology Education - Bringing Applications, Relevancy and Career Choices into the Curriculum. Janet Yagoda Shagam, Albuquerque TVI, Albuquerque, New Mexico, shagam.abq@worldnet.att.net

Most students who take biology courses are majoring in something other than biology. Therefore it is important that the biology curriculum provide a meaningful experience - something better than "watered down biology" - so they leave capable of being well-informed consumers and responsible citizens. The intermingling of various community resources into the curriculum not only engenders student enthusiasm, but also provides insight concerning career choices and the application of
Science-based skills in the workplace. This presentation will describe the development and implementation of several community-based curricula that are both affordable, easily managed as well as support the course content.

CONCURRENT PAPER SESSIONS III

Integrating Process and Content in a Workshop Human Biology Course. Marc Roy, Beloit College, 700 College Street, Beloit, WI 53511 USA, mroy@beloit.edu

In 1994, we converted an introductory human biology course from a standard lecture/lab course to a workshop. In this format, students meet in the lab for two hours, three times per week. Each class session is a mixture of hands-on activities (including experimentation, dissection, and model building), discussions, student presentations and brief lectures. One of our goals was to have students learn to think and act like scientists. Now that we have taught the course for five years, I'll offer a retrospective look at how well we have met our goals and offer insights into how we have integrated process and content.

Take-Home Examination: Assessment method or Learning Tool? Sujata R. Verma, Columbia College Chicago, svurma@popmail.colum.edu

The significance of a take-home exam becomes more defined when teaching biological sciences to students who are not majoring in science, for example the students of fine arts and communication, who need to take science courses as a general education requirement. These students, in general, have not and do not take sequential courses in biological sciences and often find the in-class examination intimidating because they are unaccustomed to the testing practices of this discipline. The presentation will deal with the rationale of take-home examinations, methods of formulation of appropriate questions and suitable assessment techniques. It will also include a summary of reaction of the students who have taken courses like Botany, Science of Nutrition and Human Anatomy and Physiology at an introductory level.

Team Teaching and Cooperative Groups in the Interactive Learning of Evolution. Beth Frieders, Biology Department, University of Wisconsin-Platteville, 1 University Plaza, Platteville, WI 53818, frieders@uwplatt.edu; Wayne Weber, Biology Department, University of Wisconsin-Platteville, 1 University Plaza, Platteville, WI 53818, weberwa@uwplatt.edu

This interactive presentation is designed to introduce a team teaching, cooperative group based approach to learning and applying concepts in evolution. In this presentation we will discuss concepts of team teaching and the advantages and challenges of the method we use in our evolution course. Examples of and audience participation in cooperative group activities will demonstrate the integration of process and content in and out of the classroom. Finally, methods of incorporating current research and literature in the learning and application of evolutionary concepts will be discussed.

CONCURRENT WORKSHOP SESSIONS III

Creating Educational Web Pages That Students Will Actually Use. Thomas J. Volk, University of Wisconsin-La Crosse, La Crosse WI 54601, volk_tj@mail.uwlax; & Scott T. Cooper, University of Wisconsin-La Crosse, La Crosse WI 54601, cooper@mail.uwlax

The internet is increasingly being used in classrooms and alternate learning places, such as the home. Building a web site that students and other people will use and return to is a challenging task. Many sites on the internet are simply pages of links to other pages, many of which are simply pages of links to other pages, and so on. Many of these are rarely, if ever, updated. There is a great need for original, interesting, and timely materials on many different subjects.

We will focus on two sites within the UW-System BioWeb, a collaboration of 14 University of Wisconsin institutions. The first, Tom Volk's Fungi, deals with fungi, especially online images. The second, GenWeb, contains links to programs students can use in genetics and molecular biology, as well as tutorials and animations that can be used in and out of the classroom.

Tom Volk's Fungi contains more than 1000 images of fungi for teaching, as well as an extensive introduction to the kingdom fungi. Its most popular
The feature is the "Fungus of the Month," which features an interesting species of fungi every month. It is primarily this last feature that keeps people returning. Tom Volk also used a great deal of humor in teaching, and this is reflected in the web pages, such as "Fungi that must be overcome to have a traditional Thanksgiving dinner," "Fungi that are necessary for a merry Christmas," and "Smuts on the Internet." There's more than one effective way to present material!

GenWeb covers a diverse array of topics, including classical and Mendelian genetics, evolution and population genetics, genome projects and genomics, human genome project and genetic disorders, microbiology and related fields, sequence analysis, bioinformatics and molecular modeling, career and educational opportunities, discussion sites, course syllabi and other educational resources. We will demonstrate interactive animations and web-based DNA and protein sequence analysis programs.

The workshop will not be a primer on how to construct web pages and use HTML, but rather will concentrate on what kinds of content to put on web pages, how to make them more accessible to students, and how to make them more interesting. We will also include some tips on internet assignments we have students perform and some of the interesting questions and feedback we have received. We will give a short presentation on our web pages, then break into groups to allow participants to design and diagram prototype web pages. Bring ideas of what sort of web pages you'd like to design in your field of expertise.

LifeLines and ICBL: Accessible, Investigative Science for Community College Biology. Margaret Waterman, Southeast Missouri State University, waterman@biology.semo.edu & Ethel Stanley, BioQUEST at Beloit College, stanleye@beloit.edu

Reading the newspaper is a familiar routine and is a habit likely to persist after students leave our classrooms. It would be great if the biology text was frequently accessed and as avidly and dynamically read and discussed as the headlines, sports, and comics sections of the newspaper. In this hands-on session we will present an innovative approach to teaching general biology designed especially for adult students in 2-year colleges, but appropriate also for 4-year college students. The approach uses the accessible, familiar format of the newspaper to combine investigative case-based learning with highly contextualized learning materials. Students access these materials by reading items, such as headlines, articles, classifieds, editorials and obituaries, in LifeLines, an electronic "newspaper." Each newspaper item links to case-based materials, e.g., interviews, reports, emails, press releases and internet sites. These materials can be electronically available on the web or on CD-ROM, or they can be print, video, audio and other media. As students explore the science behind the newspaper items, they decide on questions to investigate, they develop portfolios of tools, methodologies and knowledge, and they come to resolution on their questions. This student-centered activity can be readily integrated into current curricula and laboratory programs. Session participants will work with prototype materials, explore scenarios, and discuss implementation strategies. "Smart Board" technology will be demonstrated as part of this session.

Genes, Schemes, and Molecular Machines. Michael H. Patrick, University of Wisconsin-Madison, mpatrick@facstaff.wisc.edu, & Tim Herman, Center for BioMolecular Modeling, Milwaukee School of Engineering

This workshop will demonstrate an effective way to integrate chemistry and biology at the introductory and advanced level, using a thematic approach. We will explore how to teach the flow of genetic information at the molecular level using the Green Fluorescent Protein by integrating wet-lab exercises with computer modeling (RasMol and Chime molecular visualization software and structural files downloaded from the Protein Data Bank) plus interactive physical molecular models produced by innovative rapid prototype technology.

CONCURRENT PAPER SESSIONS IV

Teaching Biology Through Cooperative Learning. Mary Haskins, Rockhurst College

No abstract available.

From the Los Angeles Zoo to the Classroom: Transforming Real Cases via Role-Play into Productive Learning Activities. Abour Cherif, Columbia College Chicago, Sujata R. Verma, Columbia College Chicago, & Christine Somervill, Columbia College Chicago.

How many times have you encountered an interesting article concerning a real case in a journal, magazine or newspaper and wondered how you could incorporate its lesson into your classroom as a learning tool? In this presentation we explain how to transfer a relevant written article into a learning activity involving active role-play. It can be used to help your students: 1) understand the relevance of the subject matter, 2) develop critical thinking skills, 3) learn to generate multiple options and effective solutions, and 4) humanize science and discover its importance in everyday life. After briefly reviewing role-play as a teaching method, we share our model role-play activity, along with various strategies and techniques that we have used in our classrooms that have proven effective in achieving the above objectives. In this activity, we have followed Dr. Jared Diamond's article, "Playing God at the Zoo", which was published in Discover Magazine, March 1995. In the article, Mark Goldstein, Director of the Los Angeles Zoo, was faced
with several dilemmas regarding animal care which required the assistance of various experts such as veterinarians, animal-rights activists, lawyers), to arrive at feasible solutions.

The distinguishing feature of this role-play is that not only do students analyze the problem and the solution, but they personally experience the complexities of arriving at a conclusion to a problem by assuming a particular perspective of their own and using persuasion to influence the outcome. It is not until the students have explored the possibilities of resolving the problem that they become aware of the "real-life" solution. At this point, students already invested in their particular perspectives will be able to compare their "role-play" solution with the "real-life" one. While students play, act and mimic in a learning activity, they learn different aspects related to a given topic about problem-solving, as well as about exploring their own feelings, attitudes and values.

Enhancement of Classroom Learning with Outside Activities. Kathleen A. Nolan, St. Francis College, Dept. of Biology, 180 Remsen St., Brooklyn, NY 11201, knolan@worldnet.att.net

How do we make some of the abstract things that we teach our students real to them? We can do this by taking them on field trips, and to seminars and dinner presentations, and by involving them in outside research and teaching experiences. Examples of field trips that have been very successful with my students have been: visits to pathology labs, athletic trainers, cardiovascular fitness centers, research labs, botanical gardens and museums. I will give examples of the types of material I go over with the students before the visits and what I expect them to retain from these.

St. Francis College has also recently become affiliated with the American Museum of Natural History, which has opened up countless opportunities for our students. For example, students have been able to apply their knowledge of biology by a. assisting me in teaching two after-school programs and b. becoming an REU (NSF funded Research Experiences for Undergraduates) student in a research lab at the museum. Slides of students engaged in these outside activities will be used during the presentation.

Misconceptions about Ecology: Surprises in Content and Process. Lynn L. Gillie, Elmira College, One Park Place, Elmira, New York 14901, lgillie@elmira.edu

Students often take an ecology course because they are interested in the course content. They soon realize that their vision of an ecology course is usually quite different from the vision of their instructor. Students are surprised when they discover the importance of the process of mathematical model building and hypothesis testing in the field, in the laboratory, and in the computer lab. Their misconceptions can be used to an instructor's advantage as students discuss just how the science of ecology is accomplished. A large proportion of my ecology students are not traditional biology majors, but are environmental studies majors, or education majors. Their perspectives help explain how misconceptions arise and are resolved.

CONCURRENT PAPER SESSIONS V

Using Dinosaur Models to Teach Deductive Reasoning in Comparative Vertebrate Labs. Nada Chang, University of Illinois at Springfield, chang.nada@uis.edu

Due to the rapid expansion of biological knowledge, good deductive reasoning skills prepare today's biology graduate much better for the job market than an exhaustive knowledge of facts. To develop these skills, one must create a classroom environment which encourages problem-solving, active student participation and discovery, and learning deductive reasoning. Students are usually reluctant to take the responsibility for their own learning for the fear of making errors in judgement. They participate in problem-solving exercise more willingly if one uses, as a classroom and laboratory tool, material with which the student is somewhat familiar, and for which the student holds some degree of curiosity and fascination. In my experience, dinosaur models lend themselves ideally to honing student deductive reasoning skills through exercises which focus upon independent discovery of structure-function correlates. Given that the student has to rely solely on the external body features of the model, such analysis must be based on conceptual reasoning. To bring an element of reality and allow the student to draw from personal experience, models are used in conjunction with the skeleton of common living vertebrates. For instance, comparison of the anatomical features of the hind limbs of a flying reptile and hind limb of a pigeon allows deduction as to the functional relationship between hind limb design (as relevant to takeoff) and ability of the animal to engage in true flight. Such exercises result in lively discussions of probing questions.

Into the Woods - A Comparative Forestry Course with Applications to Developing a Managed Forestry Outdoor Laboratory. Kathleen Rath Marr, Lakeland College, P.O. Box 359, Sheboygan, WI 53082-0359, pmarr@intella.net

Several years ago with the help of a few small donors and a Wisconsin Conservation Corps grant, Lakeland College established the Grether Natural Laboratory, a Southern mesic forest on the campus grounds. Prior to it's recognition as a formal teaching site, paths, though poorly marked, had been utilized in this ecosystem for hiking and enjoyment. The Mayterm course, Comparative Forestry, was initiated this past
year. It involved a detailed approach to planning and sustaining our forest resource. Three groups of four students were placed in charge of the three main trails. Their goals were to map and characterize their trail with the intent to discover what flora and fauna were present. Quadrat sampling, transect sampling, dendochronology, species density and diversity were all conducted within the three-week period. Another part of the course involved travel and comparison to three other managed forests in Wisconsin. The final exam consisted of three parts: a journal describing their experiences and studies, a trail prospectus with guidesheets, and finally a "student-naturalist" tour of each assigned trail. Overall, the course was highly successful, informative, and fun! The college is now evaluating the results and working on an extended plan to manage and improve this valuable resource.

**Applications of Molecular Biology within the Developmental Biology Laboratory Curriculum: Utilization of a Research-Based Learning Approach.** Angela Bauer-Dantoin, University of Wisconsin-Green Bay, 2420 Nicolet Drive, Green Bay, WI 54311, bauera@uwgb.edu

Advances in the field of molecular biology have impacted greatly on our understanding of how differential gene expression directs the process of organogenesis in the developing embryo. While most professors address this issue in lectures or discussions in their developmental biology courses, few take the additional step to demonstrate the relevance and applications of modern molecular techniques within the context of the developmental biology laboratory. In order for students to experience firsthand how developmental biologists utilize molecular techniques to study developmental events, I incorporated a "gene expression unit" into my developmental biology laboratory curriculum. In this unit, students learn fundamental techniques in molecular biology and use these techniques to examine changes gene expression that take place during embryogenesis. They isolate RNA from a specific tissue in the developing embryo, detect the expression of specific mRNAs in that tissue by performing the reverse transcriptase - polymerase chain reaction (RT-PCR), and analyze their RT-PCR products by performing gel electrophoresis. Originally, I approached this unit by providing students with a specific, well-characterized gene to study (pit-1, a transcription factor that directs cell differentiation in the pituitary gland). However, recently I've conducted the unit with more of a research-based learning approach, in which students and I formulated and tested a novel hypothesis using the same techniques. The benefits and potential pitfalls of each approach will be discussed. Potential applications of gene expression units within other laboratory courses will also be discussed.

**What do Biological Educators get from attending CLASS?** Michele G. Wheatly, Tim Wood, Pat Renick, Jeff Vernoy, Jennifer Weil and Catherine Vance, Department of Biological Sciences, Wright State University, Dayton, Ohio 45435, michele.wheatly@wright.edu

The CLASS project is a NSF-funded educational initiative that has just completed its second year. Creating Laboratory Access for Science Students is a collaborative effort between the Departments of Biological Sciences and Teacher Education and Office of Disability Services. Educators nationwide are trained in providing laboratory exercises and field trips that are universally accessible through attendance at a 2 week summer workshop at WSU and through source materials. With two cadres that have completed the CLASS workshop, we are in a position to assess its effectiveness. Educators were provided with a pre/post test that assesses the following experiences and perceptions: (1) exposure to disability issues in the classroom and through teacher education programs (2) perceived preparedness to teach students with disabilities (3) perceived ability to implement strategies for teaching science to students with disabilities and (4) attitudes about teaching science to students with disabilities. The survey instrument was developed by the Association for the Education of Teachers in Science (Stefanich and Norman, 1996) and baseline data had been gathered by random distribution of the survey via NSTA and AETS directories. The pre test data for CLASS educators were compared with baseline data from science educators nationwide. The post test for CLASS educators was compared with the pre test to ascertain whether the workshop had achieved the desired objectives of providing strategies to educators and changing their overall attitude about teaching laboratory science to students with disabilities. This project is funded by NSF grant DUE/CCD 9653121. Please visit our website: biology.wright.edu/labgrant/index.html.