

Exploring Biology

M/W 8:30-10:20

Hagen 404

**Instructor:** Dr. Alison Wallace wallacea@mnstate.edu (*note the 'a' in wallacea!*)

Office: 407-P Hagen (218) 477-2843

Office Hours: Mon 10:30-11:30; 2:00-3:00 Thurs 9:00-10:30  
 Tues 9:00-11:00 Fri 9:30-12:00  
 Wed 10:30-11:30; 2:00-3:00

*NOTE: An advance appointment is strongly recommended since committee and research meeting conflicts do come up occasionally and I may not be in my office. Additional times may also be scheduled, just e-mail or call ahead. I check my e-mail first thing in the morning.*

**Course Description:** This course is specifically designed for prospective elementary teachers. Includes principles of biology with emphasis on human biology, basic concepts in ecology and the impact of specific environmental problems. Lab included.

**Where to find course information:** D2L

**Required Texts:**

- *Essentials of the Living World*, 2008, by George B. Johnson. ISBN: 0073109398
- *Mammal in the Mirror* selections by David Barash and Ilona Barash (*links on D2L*)
- *(The Dominant Animal: Human Evolution and the Environment* by Paul R. Ehrlich and Anne H. Ehrlich) – this is still being decided

**Required Supplies:**

- Lab Notebook. I require a quad-ruled spiral or bound notebook for recording notes on scientific investigations and for making graphs. You do not need to buy the really expensive hard cover lab notebooks.

**Course Objectives:** The underlying framework for this course consists of

- 1) the life science and nature of science concepts required by the Minnesota Board of Teaching for elementary teachers, and
- 2) the overall goal and specific competencies addressed by a Dragon Core 10 “People and the Environment” course.

We will begin to explore these concepts and competencies by asking a series of questions that build on your prior experiences and knowledge as a living organism. The topics discussed and studied in the course are organized into the following units:

Unit	Questions
Ecology and Ecosystems	How is it that no organism can exist on its own and all life is interdependent? How do organisms interact with other organisms and their environment in order to survive?

Genetics and Evolution	How have organisms evolved to adapt to their environments? What are the mechanisms at the cellular, individuals, and the population levels? How do organisms respond to changes to their environments? What factors contribute to endangered and extinct species?
Organisms and their Environments	What types of organisms exist on our planet? What adaptations are there in different organisms that help keep them alive? Are humans any different than other organisms in the way they interact with and are sustained by their environments? What makes humans the “dominant animal” and will it stay that way?

By the conclusion of this course, students will be able to:

- Clearly and accurately communicate modern biological concepts that address the above questions.
- Employ these concepts to observe and interpret organisms
- Investigate and analyze biological phenomena using a scientific approach.
- Understand how basic biological concepts are relevant to their current and future lives and to the lives of their own students.
- Identify the structure, function, and processes of ecosystems (the physical environment and biological community of which human society is a part and on which it depends).
- Explain the concept of sustainability.
- Identify and evaluate possible pathways to a sustainable future and demonstrate an awareness of the tradeoffs necessary to achieve a sustainable future.
- Assess and analyze the environmental problems of a technological society using the framework of well-founded physical and biological principles.
- Describe the relationships between environments and socio-cultural groups, and identify how natural resource challenges are being addressed by the social, legal, economic, political, cultural, and religious systems within societies.

#### **DC 10: PEOPLE AND THE ENVIRONMENT**

**Goal:** To develop students’ understanding of the concept of sustainability and the challenges we face in responding to environmental variables and resolving environmental problems. Students will examine how societies and the natural environment are intimately related. A thorough understanding of ecosystems and the ways in which different groups interact with their environments is the foundation of an environmentally literate individual.

**Why is it so important for everyone to know about biology?** As a global citizen, you face an amazing future where everyone’s life will be touched by biological discoveries and applications from genetic engineering to medical breakthroughs, as well as unprecedented environmental challenges. As a prospective teacher, you face a time where it is imperative that every one of your future students becomes “biologically literate”; meaning they are well-informed, thoughtful individuals who can understand their changing world and have some say in the role biological discoveries play in their future. The active learning approach of this course will give you a chance to further develop your “lifelong learning” skills in preparation for the time when you will be encouraging these skills in your own students.

**A note about the instructional approach:** Exploring Biology is specifically designed to be taught (and learned!) via an active learning approach in a combination lab/lecture environment. You may find yourself working in groups to analyze data, devise an analogy to explain a biological process, or design and set up an experiment, just to name a few of the possibilities. The success of this venture

depends on both of us – me, by providing opportunities for your involvement, and you, by your active participation in the process.

**Instructional Strategies:** “hands-on, minds-on” laboratory and field activities; open-ended, long-term investigations; small and large group discussions; jigsaw activities; lectures; demonstrations; multimedia presentations by students and instructor; online and video/DVD movies; multiple choice, short answer, and essay assignments and exams; lab reports and oral presentations requiring reporting and analyzing data; creative writing; physical models; online simulations

**MSUM Conceptual Framework:** See the last page and read carefully. This course is designed to be taught and learned within the context of this conceptual framework. Whether you are almost ready for PFY, or you are just beginning your elementary education major, you will be expected to demonstrate your fulfillment of the expectations detailed in the conceptual framework in this course. Use the following websites as well to learn more about what is expected of you as a teacher candidate.

- MN BOT Standards of Effective Practice:  
<http://www.revisor.leg.state.mn.us/arule/8710/2000.html>
- INTASC Standards:  
<http://www.ccsso.org/projects/Interstate%5FNew%5FTeacher%5FAssessment%5Fand%5FSupport%5FConsortium/Projects/Standards%5FDevelopment/>

<b>Course Evaluation (tentative):</b>	<u>Points</u>	<u>Percentage of Overall Grade</u>
Organism Reports (5 at 20 pts)	100	20%
Exams (2 at 50 pts)	100	20%
Lab Journal Scavenger Hunts (2 at 25 pts)	50	10%
Human Ecology Assignments	150	30%
Human Ecology Project	100	20%
	500	100%

**Grading Scale (based on overall percentage):**

A	93-100	B-	80-82.9	D+	67-69.9
A-	90-92.9	C+	77-79.9	D	63-66.9
B+	87-89.9	C	73-76.9	D-	60-62.9
B	83-86.9	C-	70-72.9	F	below 60

**Special Accommodations:**

Students with disabilities who believe they may need an accommodation in this class are encouraged to contact Greg Toutges, Coordinator of Disability Services at 477-5859 (voice) or 1-800-627-3529 (MRS/TTY), CMU 222 as soon as possible to ensure that accommodations are implemented in a timely fashion.

**Why are you required to take this course?** Exploring Biology activities are designed to give you numerous opportunities to make observations, ask questions, design experiments, collect long-term data, analyze your own data, and share your results with others. In other words, you will actually do science in a way that mirrors how professional scientists often work. The importance of developing a strong understanding of the nature of science is emphasized in the Minnesota’s Board of Teaching

Rules for Elementary Teachers (see below).

Lab activities are selected specifically to provide you with direct, introductory experiences with the “fundamental concepts and principles of life science” (see below, #6). In most cases, your direct experiences will precede the discussion and application of fundamental concepts. Thus the purpose of the lab activities are to help you figure out what questions you would like to raise as you study each unit, and to give you concrete examples with which to apply your newly acquired knowledge.

While many teaching strategies that may be applicable to doing science with elementary students will be modeled, keep in mind that this course is not a methods course. The concepts and teaching strategies used are chosen for their appropriateness for college-level prospective elementary teachers. The lab activities are also selected to familiarize you with organisms and environments that you could use as a practicing teacher. You will learn science teaching methods during your PFY experience.

### **Minnesota Rule 8710.3200 (Teachers of Elementary Education)**

Subpart 3 (Subject matter standards, elementary education)

Item E (A teacher of children in kindergarten through grade 6 must demonstrate a fundamental knowledge of scientific perspectives, scientific connections, science in personal and social perspectives, the domains of science, and the methods and materials for teaching science and scientific inquiry. The teacher must...)

- 1) understand science as a human endeavor, the nature of scientific knowledge, and the historical perspective of science
- 2) know and apply the understandings and abilities of scientific inquiry including the ability to:
  - a. identify questions and concepts that can be explored through scientific inquiry;
  - b. design and conduct scientific investigations;
  - c. use appropriate scientific instrumentation and equipment and mathematics as tools to improve scientific investigations and communications;
  - d. compare the use of multiple types of inquiry for answering questions;
  - e. evaluate alternative explanations and models based on evidence, current scientific understanding, and logic; and
  - f. communicate and defend a scientific argument.
- 4) use scientific understandings and abilities when making decisions about personal and societal issues;
- (6) know and apply the fundamental concepts and principles of life science concerning the characteristics of organisms, the life cycle of organisms, the interrelationships of organisms and environments, structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems and their interrelationships, and diversity and adaptations of organisms.

NOTE: For a full listing of Minnesota Board of Teaching Rules for Early Childhood and Elementary Teachers, see these web sites:

- ☐ Early Childhood: <http://www.revisor.leg.state.mn.us/arule/8710/3000.html>
- ☐ Elementary: <http://www.revisor.leg.state.mn.us/arule/8710/3200.html>

### **Course Policies:**

*In the case of extended illnesses or other extreme situations, please arrange a meeting to make special arrangements regarding the following policies.*

Missed Classes: If you miss a lab activity for any reason, I’m sorry but it usually cannot be made up. You may not be able to fully complete your assignments if you miss class...so please try not to miss

unless you have an unavoidable emergency.

Late Assignments/Missed Exams: Assignments turned in late or make-up exams will not be allowed unless a universal excuse form (found on D2L) has been approved and signed.

Extra Credit Opportunities: Be attentive for announced extra credit opportunities, which will be posted via D2L. These may be attending lectures, visiting elementary classrooms, helping out at the science center, etc. Type a brief response for each opportunity, summarizing what you did and what you thought about it, *and turn in at the end of the semester with the final exam*. They are each worth 0.5% and you may do a maximum of 4.

**Tips for Success:** Come to class prepared to be an active learner full of questions. Keep on top of the units and do not let them get away from you! E-mail, stop by, or call me whenever you need help...and do so before you get behind. An appointment is recommended to make sure that I can give you undivided attention and am not meeting with other students or faculty.

**A Note About the Instructor:** If you have read this far – I am impressed! You deserve to know a little bit more about me since we will be spending a semester together. I grew up on a farm in southeastern MN, and have lived in 1) Long Island, NY, 2) Berkeley, CA, 3) Grand Forks, ND, and now Moorhead, MN. I decided to major in biology as an undergraduate at St. Olaf College, when I got a chance to spend an entire summer studying house wren (little brown bird) behavior on a ranch in Wyoming. For my dissertation, I studied how the growth of nitrogen-fixing plants and their competition with introduced grasses may be affected by the elevated levels of CO<sub>2</sub>. My Ph. D. is in Ecology and Evolution from the Stony Brook University in NY. I have taught science classes from ages 3 to adult and think that helping people to recognize the interdependence of life is just about the most important thing I could be doing with my life. I am married to the most interesting person I have ever met, and have the two most miraculous children you will ever find (all mothers say that - I bet yours does!). Someday I hope to cut up all my front lawn and put in a tallgrass prairie (hey, no mowing!) I perform as a violinist with the F-M Symphony and often play with the MSUM Orchestra to keep sane and to remind myself that while humans are “just” animals, we are creative, intelligent, remarkable animals who can transcend our basic existence through sound and beauty. I get the same feeling playing a Beethoven symphony as I do listening to a house wren sing, looking down from the top of a mountain, finding a tiny prairie wildflower, or even taking a closer look at a mosquito through the microscope! Life is beautiful and very worthy of our attempts to understand how it works. My goal as your instructor is to do what I can to ensure that your future students will be able to enjoy the beauty and wonder of life for generations to come. It is all around us ... we just need to open our eyes and take a look.....

**CONCEPTUAL FRAMEWORK OF THE MSUM TEACHER EDUCATION UNIT**

MSUM candidates are professionals who are knowledgeable, reflective, humanistic, and creative.

**Knowledgeable:** MSUM candidates display competence in their subject matter, built upon a strong grounding in liberal studies. MSUM candidates understand the principles of learning, assessment and technology. They understand and apply legal and ethical considerations to all aspects of their work. MSUM candidates are able to integrate theory and practice, and view learning as an active process. MSUM candidates demonstrate the ability to model connections between philosophical foundations and best practices in the field. As life-long learners, MSUM candidates engage in research and complex thinking. They design opportunities for others to seek knowledge and to understand themselves as members of the world community.

**Reflective:** MSUM candidates engage in thoughtful analysis of the meaning and significance of their actions, decisions, and results with regard to their work in order to assess progress in meeting this guiding principle. It is through this reflective process that candidates improve instruction, implement new ideas, abandon ineffective methodologies, and enhance learning outcomes for their students. MSUM candidates are skilled at analyzing their teaching from a variety of perspectives and identifying connections between teaching strategies and student learning. In addition, candidates utilize a variety of techniques to question their procedures and consider alternatives for instruction and student growth. MSUM candidates recognize learning, motivational, and developmental variables and relate those dimensions to their teaching practices. Finally, MSUM candidates bring a questioning spirit to received wisdom and conventional practice when needed.

**Humanistic:** MSUM candidates value the personal worth of each individual. This is based on a belief in people's potential and innate ability to develop to their fullest. MSUM candidates' actions are grounded in knowledge of different cultural and ethnic groups within the world community, and in knowledge of the influence of culture and history, ethnicity, language, gender and socio-economics on one's life. This knowledge base informs candidates' decision-making as they create environments that promote freedom, compassion, and success for all learners. MSUM candidates are fair-minded in their interactions with others, as well as sensitive to and accepting of individual differences. Further, MSUM candidates have an understanding of aesthetics and the diversity that is part of the human experience and will incorporate this knowledge into their work. MSUM candidates recognize and accommodate a variety of linguistic and nonlinguistic interpersonal skills in their actions with others. MSUM candidates foster resiliency in the students with whom they work and model these qualities in their own work.

**Creative:** MSUM candidates understand the powerful resources of the arts and sciences and use their knowledge of these areas to bring the best of their imaginative and creative acts into the classroom. MSUM candidates recognize the important role creativity plays in the design of instruction and classroom environment. They will, for themselves and for their students, meet new situations with resourcefulness, excitement and curiosity, with an investigative attitude, and with the ability to pose, seek and design solutions to problems. MSUM candidates are cognizant of the aesthetic elements of the world and draw on that knowledge to make curricular decisions designed to help students not only learn about aesthetics, but to also learn how to think about the world at large.