

**Exploring Biology (BIOL 370)  
Spring 2020**

**Class: HA 404 Mon and Weds  
1.30 pm to 2.45 pm OR 3.00 pm to 4.15 pm**

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**\*\*This syllabus is tentative and subject to change (you will be informed of any changes)\*\***

**Office hours: See website for times: [web.mnstate.edu/marryand](http://web.mnstate.edu/marryand)**

**First and Foremost:**

Although I have been living in the Fargo/Moorhead area since 2001, I am "not from around here". If for ANY reason you do not understand something I say I expect you to put your hand up and ask me to repeat myself. The only way for you to fully understand this course is to fully understand me. **Such interruption will NOT annoy me in any way.** HOWEVER, other interruptions will not be acceptable.

Most importantly, I expect you to actively participate in class each day. Active participation means contributing to all discussions, offering supportive, but critical, responses, and committing to the in-class work that will go on. Your in-class participation is vital in my class.

**Overview of course:**

The underlying framework for this course consists of the life science and nature of science concepts required by the Minnesota Board of Teaching for elementary teachers

This course includes principles of biology with an emphasis on human biology, basic concepts in ecology, and the impact of specific environmental problems. The course includes two lab hours integrated into the bi-weekly meeting times.

The goal of this course is to demystify biology and the best way to do that is to engage you in an active learning approach in a combination laboratory/lecture environment.

There will be a range of activities working in groups to analyze data, devising analogies to explain biological processes, and designing then executing an experiment.

Class will largely be used for lab activities, group activities, and supplemental material to enhance the readings (such as videos, discussions, news articles, and so on).

**You will be responsible for doing the readings and working on the assignments outside of class. It will be tough, if not impossible, to pass the class with a high grade if you do not regularly attend the class sessions.**

### **Student Competencies:**

1. Ecology and Ecosystems: How is it that no organism can survive on its own and all life is interdependent? How do organisms also interact with their environments in order to survive? What causes population crashes and explosions? How does energy flow and matter cycle through ecosystems?

2. Genetics and Evolution: How have organisms evolved to adapt to their environments? What are the mechanisms of evolution at the cellular, individual, and population levels? How do organisms adapt to changes to their environments? What factors contribute to endangered and extinct species?

3. Organisms and their Environments: What types of organisms exist on our planet? What kinds of different adaptations keep various types of organisms alive? Are humans any different than other organisms in the way they interact with and are sustained by their environments? What does sustainability really mean for any species, including humans? What makes humans the dominant animal at this point in the earth's history, and will it stay that way?

### **Learning Outcomes:**

1. Understand science as a human endeavor, the nature of scientific knowledge, and the historical perspective of scientific argument.

2. Know and apply the understandings and abilities of scientific inquiry including the ability to: identify questions and concepts that can be explored through scientific inquiry; design and conduct scientific investigations; use appropriate scientific instrumentation and equipment and mathematics as tools to improve scientific investigations and communications; compare the use of multiple types of inquiry for answering questions; evaluate alternative explanations and models based on evidence, current scientific understanding, and logic; and communicate and defend a scientific argument.

3. Use scientific understandings and abilities when making decisions about personal and societal issues.

4. 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.

5. Know and apply the fundamental concepts and principles of ecology and the natural environment, and be able to address these concepts in regards to human sustainability.

### **Text (Required):**

- Campbell: Essential Biology, 5<sup>th</sup> ed. 2012 by E.J. Simon, J.L. Dickey, and J.B. Reece.
- Half Earth: Our Planet's Fight for Life by E.O. Wilson (free online through Perusall)
- A Sugar Creek Chronicle: Observing Climate Change from a Midwestern Woodland by Cornelia Mutel

### **Other requirements:**

- Internet access
- Notebook to serve as a lab journal

### **Attendance:**

Class attendance is **expected**. **If you are not there, you cannot contribute.**

Being late is **not acceptable**. It is simply rude to walk in while the class is in session, so please try and avoid doing so. That being said, if you are running a few minutes behind please do not skip the class period to avoid being late.

Of course, I understand the possibility of being absent from class due to participation in a university sponsored sport or creative event. However, I require written notice from your coach/advisor in class at least a week prior to your event.

<http://www.mnstate.edu/policies/absences.aspx>

### **Emails:**

*I will only read and reply to Emails asking for an appointment to come see me.*

**ABSOLUTELY** no Emails complaining about class performance will be replied to. **COME AND SEE ME IN PERSON DURING OFFICE HOUSE TO DISCUSS ANY PROBLEMS YOU MAY BE HAVING.** **No assigned class work will be accepted via Email**

## Cell Phones:

I consider cell phones going off during class incredibly disrespectful to both your fellow classmates and to me. Turn them OFF **BEFORE** entering the class room.

If your cell phone goes off during class you will be asked to leave. If, however, you are waiting for an **emergency call**, see me **BEFORE** class to let me know what you are waiting for. I will not hear any explanations after the fact. **You must notify me before class begins of the call you are expecting.**

**IF YOUR CELL PHONE GOES OFF DURING AN EXAM YOU WILL FAIL THE CLASS!**

## Exam Policy:

For those of you involved in sporting (or other creative) events for the university, I will, of course, allow you to take any missed exams. However, I require written notice from your coach/advisor in class at least a week prior to the exam.

I will allow a student to take a missed exam due to a very personal or medical emergency.

**Absolutely NO cheating will be tolerated**

<http://www.mnstate.edu/policies/academichonesty.aspx>

## Minnesota Rule 8710.3200 (Teachers of Elementary Education)

Subpart 3 (Subject matter standards, elementary education)

Item J (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:

- identify questions and concepts that can be explored through scientific inquiry;
- design and conduct scientific investigations;
- use appropriate scientific instrumentation and equipment and mathematics as tools to improve scientific investigations and communications;
- compare the use of multiple types of inquiry for answering questions;
- evaluate alternative explanations and models based on evidence, current scientific understanding, and logic; and
- communicate and defend a scientific argument.

3) Use scientific understandings and abilities when making decisions about personal and societal issues;

4) 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.

### **Education Majors -- 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.

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 elementary science teaching methods during your elementary science methods course and field experiences.

### **Sustainability Majors -- Why are you required to take this course?**

Your studies and future career will undoubtedly be quite interdisciplinary, yet will always return to the overarching goal of biological, environmental, and economic sustainability of the "dominant animal" on our planet, namely humans! It is crucial that you obtain a good understanding of biological principals and ecological economies responsible for the sustenance of all life forms due to the fact that life is quite interconnected and we would be remiss if we just focused on humans and human economies.

### **In Addition: -**

**Sexual Assault:** Acts of sexual violence are intolerable. MSUM expects all members of the campus community to act in a manner that does not infringe on the rights of others. We are committed to eliminating all acts of sexual violence.

MSUM faculty and staff are concerned about the well-being and development of our students. We are obligated to share information with the MSUM Title IX Coordinator in certain situations to help ensure that the students' safety and welfare is being addressed, consistent with the requirements of the law. These disclosures include but are not limited to reports of sexual assault, relationship violence, and stalking.

If you have experienced or know someone who has experienced sexual violence, services and resources are available. You may also choose to file a report. For further information, contact Lynn Peterson, Title IX Coordinator, [petrsnly@mnstate.edu](mailto:petrsnly@mnstate.edu); 218-477-2967, or Ashley Atteberry, Director of Student Conduct & Resolution; [ashley.atteberry@mnstate.edu](mailto:ashley.atteberry@mnstate.edu), 218-477-2174; both located in Flora Frick 153. Additional information is available at: [www.mnstate.edu/titleix](http://www.mnstate.edu/titleix)

**Publications Statement-**This publication, or any other material related to this course, is available in alternate format upon request. Please contact me at: [marryand@mnstate.edu](mailto:marryand@mnstate.edu)

**Accessibility-** Minnesota State University Moorhead is committed to providing equitable access to learning opportunities for all students and strives to make courses inclusive and accessible in accordance with sections 504 and 508 of the 1973 Rehabilitation Act and the Americans with Disabilities Act. The University will make reasonable accommodations for students with documented disabilities. Accessibility Resources (AR) is the campus office that collaborates with students in need of accommodations and assists in arranging reasonable accommodations.

If you have or think you may have a disability, please contact Accessibility Resources at (218) 477-4318 (V), (800) 627.3529 (MRS/TTY), or stop by to schedule an appointment with the Director of Accessibility Resources in 154C Flora Frick Hall.

Please also contact Accessibility Resources if you are currently registered for services and have concerns. Additional information is available on the AR website: <http://www.mnstate.edu/accessibility> The ADA Coordinator for students and ADA compliance issues is Kara Gravley-Stack, Dean of Students; (218) 477-2391, [kara.gravleystack@mnstate.edu](mailto:kara.gravleystack@mnstate.edu), or 153 Flora Frick Hall.

**Emergency Preparedness Guide and Maps-** Building maps showing emergency exit routes, fire extinguisher locations, and fire alarm pull stations are conspicuously located in classrooms, labs, conference rooms, departmental main offices and residence halls.

The Emergency Preparedness Guides (flip style booklets) are located with the maps. Please review the floor plans as well as the guide so you know how to respond in an emergency situation to help protect yourself and others. If you have

questions, please contact Jim Schumann, Director of Public Safety, at [james.schumann@mnstate.edu](mailto:james.schumann@mnstate.edu) or 218-477-5869. <https://www.mnstate.edu/public-safety/>

### Assignment Points:

Course will be out of 1000 points

#### Lab Activities, Lab Journal, Reports, and Presentation

Weekly Lab Activities	120 points
Fast Plant Experiment & Paper	40 points
Transpiration Experiment & Paper	40 points
Duckweed Experiment & Presentation	50 points
<u>Mealworm Observation (in Lab Journal)</u>	<u>50 points</u>
<b>TOTAL</b>	<b>300 points [30% of your grade]</b>

#### Discussions and Readings

Essential Biology (textbook) Discussion Questions	72 points
Half Earth (online text) Perusal Grading	66 points
<u>Sugar Creek Chronicles Discussion Questions</u>	<u>62 points</u>
<b>TOTAL</b>	<b>200 points [20% of your grade]</b>

#### Exams

Three Open Note Mini-Exams	100 points x 3
<u>Comprehensive Final (Open Note, Open Lab Journal)</u>	<u>200 points</u>
<b>TOTAL</b>	<b>500 points [50% of your grade]</b>

Plus any bonus points as I see fit

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#### Grading:

94-100% A	83-86% B	72-75% C	63-65% D
90-93% A-	80-82% B-	69-71% C-	61-62% D-
87-89% B+	76-79% C+	66-68% D+	60% below F

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### Course Outline:

Please remember that this outline should be considered tentative. The pace of the class is governed by your understanding of the material, questions asked and answered, and (unfortunately - due to where we are) the weather!

The dates and topics for each day are included in the "schedule" document on D2L. These are tentative and subject to change. They will also depend upon how much content we are able to get through on any given day. You will be notified of changes that are made to the upcoming schedule.

## Topic

Jan	13	Introduction	
	15	What is life?	
Jan	20	<b><u>NON-INSTRUCTIONAL DAY/NON-DUTY DAY</u></b>	
	22	Fast plants/Artificial selection	
Jan	27	Experimental design	
	29	Fast plants/Artificial selection continued	
Feb	3	Ecology	
	5	<b>Exam 1</b>	
<b>Feb</b>	<b>10</b>	<b>Out of class assignment</b>	
	<b>12</b>	<b>Out of class assignment</b>	
<b>Feb</b>	<b>17</b>	<b>Out of class assignment</b>	
	19	Data analysis / Population dynamics	
			<i>Out of class assignment Due</i>
Feb	24	Human population dynamics	
	26	Cells - Structure and function	
Mar	2	Time to breathe and get ready for .....	
	4	<b>EXAM 2</b>	
Mar	9 - 13	<b><u>Spring Break!!!!!!!!!!!!</u></b>	
Mar	16	DNA structure and function	
	18	DNA structure and function	
Mar	23	Cell reproduction	
	25	DNA / Heredity	
Mar	30	Natural selection	
Apr	1	Evolution	
Apr	6	Phylogeny and Classification	
	8	Fast plants / Artificial selection	



Apr	13	<u>NON-INSTRUCTIONAL DAY/NON-DUTY DAY</u>
	15	Exam 3
Apr	20	Fast plants / Artificial selection
	22	Climate change
Apr	27	Climate change
	29	Climate debate
May	4	Climate debate / <u>LAST DAY OF CLASS</u>
	6	Study Day - <i>No Class</i>

**Exam Week:**

**Final Exam May 8<sup>th</sup> Friday**

Comprehensive Final Exam at 11:30 AM [1.30 pm section]

Comprehensive Final Exam at 2:00 PM [3.00 pm section]

***NO exceptions!!!! This is the official designated time for the final exam for this course. There will be no clashes unless another instructor changes an exam time - which they cannot do!!!!***