BIOL 4395-110, CRN 10752, Biology Capstone
Fall 2021 rev. 01.18.2021
Texas A&M University-Central Texas

COURSE DATES, MODALITY, AND LOCATION

Mode of instruction and course access:
This will be a 16 week course and will be taught Online via WebEx.

Time/Day: Lecture: TR 2:30 – 3:45
Where: Online via WebEx
Students will have their computer cameras turned on during the WebEx lectures and are expected to actively participate. This course uses the A&M-Central Texas Canvas Learning Management System [https://tamuct.instructure.com].

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Dr. Weiser Erlandson
Office: 302H Beck Family Heritage Hall
Phone: 254-519-5723
Email: CANVAS mail or laura.erlandson@tamuct.edu

Office Hours:
Office Hours: by appt. only via WebEx

Student-instructor interaction:
Lecture will meet through the CANVAS LMS synchronously via WebEx for lecture on Thursdays. You may contact me through email or CANVAS. Expect me to respond back to any emails within 24 hours (business days only). If I do not, please check back with me to be sure that your email was not lost in transit.

WARRIOR SHIELD

Emergency Warning System for Texas A&M University-Central Texas
Warrior Shield is an emergency notification service that gives Texas A&M University-Central Texas the ability to communicate health and safety emergency information quickly via email, text message, and social media. All students are automatically enrolled in Warrior Shield through their myCT email account.

Connect to Warrior Shield by 911Cellular [https://portal.publicsafetycloud.net/Account/Login] to change where you receive your alerts or to opt out. By staying enrolled in Warrior Shield, university officials can quickly pass on safety-related information, regardless of your location.

COVID-19 SAFETY MEASURES

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University-Central Texas has adopted policies and practices to minimize virus transmission. All members of the university community are expected to adhere to these

measures to ensure their own safety and the safety of others. Students must observe the following practices while participating in face-to-face courses, course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.) and co-curricular programs:

- Self-monitoring—Students should follow CDC recommendations for self-monitoring. Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction. Students required to quarantine must participate in courses and course-related activities remotely and must not attend face-to-face course activities. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.
- Face Coverings— Face coverings must be worn inside of buildings and within 50 feet of building entrances on the A&M-Central Texas Campus. This includes lobbies, restrooms, hallways, elevators, classrooms, laboratories, conference rooms, break rooms, non-private office spaces, and other shared spaces. Face coverings are also required in outdoor spaces where physical distancing is not maintained. The university will evaluate exceptions to this requirement on a case by case basis. Students can request an exception through the Office of Access and Inclusion in Student Affairs.
    - If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the Office of Student Conduct. Additionally, the faculty member may choose to teach that day's class remotely for all students.
- Physical Distancing—Physical distancing must be maintained between students, instructors, and others in the course and course-related activities.
- Classroom Ingress/Egress—Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.
- The university will notify students in the event that the COVID-19 situation necessitates changes to the course schedule or modality.

COURSE INFORMATION

Course Overview and description

Capstone seminar focusing on life science research conducted by seniors and faculty.
Prerequisite(s): BIOL 3380 and senior standing

Student Learning Outcomes

Students will:

a. understand the procedures of scientific research

b. be able to critically evaluate scientific research

c. be able to formulate a question based on observations

d. design and implement an experiment to test a hypothesis

e. be able to disseminate research data orally and through a written report

Required Reading and Textbook(s):

1. You will be required to read several peer reviewed research papers that will be assigned during the semester
2. Recommended book: Pechenik, J. 2015. A short guide to writing about biology, 9th ed. Pearson

This is a Writing Instructive (WI) course so writing will be an integral part of my instruction and our interactions. Writing will also be a fundamental way that I measure student mastery of course content. WI means that you will have several opportunities to work on improving your writing skills. For example, you will work on a sequence of writing tasks that will lead to your final Thesis Report.

COURSE REQUIREMENTS

Course Assessments:

- 45% Final thesis report (SLO: a, b, c, d, e)
- 15% *ETS*® Major Field Test for Biology (SLO: a, b)
- 15% Oral presentation of final thesis (SLO: e)
- 15% Weekly paper critiques (SLO: a, b)
- 5% Weekly subject quizzes on CANVAS (SLO: a, b)
- 5% Leading a discussion/participation in discussion (SLO: a, b)

Thesis report

During this semester, you are required to design and conduct an original experiment and submit a thesis report based on your experiment. You will be working on this over the duration of the semester and turning in sections of your paper several times for both instructor feedback and peer review. This will be an iterative process requiring you to take advantage of the TAMUCT Writing Center (4th Floor, Warrior Hall). Detailed instructions and assessment rubric are attached to the end of this syllabus. **While Dr. Erlandson is happy to help out in an emergency, it is your responsibility to ensure that you can take care of your experiment including set up, taking data, and care of any research animals/plants you have for the duration of the semester.**

ETS Biology Field Test

At the end of the semester, you will take a comprehensive exam through Educational Testing Service (ETS). The *ETS*® Major Field Test for Biology consists of 150 multiple-choice questions, a number of which are grouped in sets and based on descriptions of laboratory and field situations, diagrams or experimental results. Some of the questions within each of the major areas of biology are designed to test analytical skills. During the semester, we will prepare for this examination during some of our meetings by reviewing the major areas of concentration (cell biology, molecular biology, genetics, organismal biology, population biology, evolution, and ecology). Information about the *ETS*® Major Field Test for Biology can be found at this website: https://www.ets.org/mft/about/content/biology

Oral Presentation

At the end of the semester, you will present your research to the class and invited guests. This is a formal scientific presentation designed to strengthen your oral skills and familiarize you with the process of presenting research to an audience. Detailed instructions and assessment rubric are attached to the end of this syllabus.

Scientific Paper Critique Assignment
Each week you will be assigned a peer reviewed scientific paper to critique. Your assignment is to critically analyze these research studies for their scientific merit. You will be expected to thoroughly research the topic and provide a thorough critique. In addition, each student will be required to lead one or more class discussions based on these critiques during the semester. Detailed instructions and assessment rubric are attached to the end of this syllabus.

Grading Criteria Rubric and Conversion
Grading scheme
A 4.00 (90 +) Achievement that is outstanding relative to the level necessary to meet course requirements.
B 3.00 (80-89%) Achievement that is significantly above the level necessary to meet course requirements.
C 2.00 (70–79%) Achievement that meets the course requirements in every respect.
D 1.00 (60–69%) Achievement that is worthy of credit even though it fails to meet fully course requirements.
F 0.00 (<60%) Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an "I" (incomplete).
I (Incomplete) The "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances, the student was prevented from completing the work of the course on time. The assignment of an "I" requires a written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements. In no event may any such written agreement allow a period of longer than one year to complete the course requirements. For graduate and professional students, an "I" is to remain on the transcript until changed by the instructor or department. For all other students, work to make up an I must be submitted within one year of the last day of final examinations of the term in which the "I" was given; if not submitted by that time, then the "I" will automatically change to an F. ***To obtain an incomplete you must have been doing passing work in the course***

Posting of Grades

- Grades will be posted on CANVAS as I am finished with my evaluation of your work. I try to provide feedback within a week.

COURSE OUTLINE AND CALENDAR

Weekly meetings will consist of student research discussions, peer reviews, and critiques of peer reviewed research. Each week we will critically discuss one scientific paper, exploring different subdisciplines of biology and methods of research. This discussion will be led by one student in

the course on a peer reviewed paper of your choosing (dated 2020 – 2021). You will also have time to conduct your research and write your thesis each Thursday.

ASSIGNMENT	DATE DUE
Paper critiques/discussions	Thursdays weekly
Quizzes	Tuesdays weekly
Thesis topic	January 28
Experimental Design	February 4
Introduction/Literature review outline	February 11
Introduction/Literature review annotated outline	February 25
Materials & Methods (M&M) section	March 4
Introduction/Literature review + M&M	March 25
Results and discussion sections	April 22
First full thesis submission	April 29
Final thesis submission	May 13
Oral presentations	May 12 (submit on Canvas); May 13 present to class

Important University Dates

January 18, 2021	Martin Luther King, Jr Day (University Closed)
January 19, 2021	Add, Drop and Late Registration Begins for 16 Week Classes $25 Fee assessed for late registrants
January 19, 2021	Classes Begin for Spring Semester
January 21, 2021	Deadline for Add, Drop, and Late Registration for 16 Week Classes
February 3, 2021	Deadline to Drop 16-Week Classes with No Record
March 15-19,2021	Spring Break (No Classes - Administrative Offices Open)
March 22, 2021	Class Schedule Published for Summer Semester
March 26, 2021	Deadline for Spring Graduation Application for Ceremony Participation
April 5, 2021	Registration Opens for Summer Semester
May 14, 2021	Deadline to Withdraw from the University for 16 Week Classes
May 14, 2021	Spring Semester Ends
May 14, 2021	Deadline for Applications for Tuition Rebate for Spring Graduation (5pm)
May 14, 2021	Deadline for Spring Degree Conferral Applications to Registrar's Office $20 Late Application Fee.
May 15, 2021	Spring Commencement Ceremony Bell County Expo 7pm

TECHNOLOGY REQUIREMENTS AND SUPPORT

Technology Requirements

This course will use the A&M-Central Texas Instructure Canvas learning management system. We strongly recommend the latest versions of Chrome or Firefox browsers. Canvas no longer

supports any version of Internet Explorer.

As we will be having lecture via WebEx, you will need a computer with internet access plus web camera, speaker, and microphone (or headset).

Logon to A&M-Central Texas Canvas [https://tamuct.instructure.com/] or access Canvas through the TAMUCT Online link in myCT [https://tamuct.onecampus.com/]. You will log in through our Microsoft portal.

Username: Your MyCT email address. Password: Your MyCT password

Canvas Support

Use the Canvas Help link, located at the bottom of the left-hand menu, for issues with Canvas. You can select "Chat with Canvas Support," submit a support request through "Report a Problem," or call the Canvas support line: 1-844-757-0953.

For issues related to course content and requirements, contact your instructor.

Online Proctored Testing

A&M-Central Texas uses Proctorio for online identity verification and proctored testing. This service is provided at no direct cost to students. This course requires identity verification and proctored testing, the technology requirements are: Any computer meeting the minimum computing requirements, plus web camera, speaker, and microphone (or headset). Proctorio also requires the Chrome web browser with their custom plug in.

Other Technology Support

For log-in problems, students should contact Help Desk Central

24 hours a day, 7 days a week

Email: helpdesk@tamu.edu
Phone: (254) 519-5466
Web Chat: [http://hdc.tamu.edu]
Please let the support technician know you are an A&M-Central Texas student.

UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES

Drop Policy

If you discover that you need to drop this class, you must complete the Drop Request Dynamic Form through Warrior Web.

[https://dynamicforms.ngwebsolutions.com/casAuthentication.ashx?InstID=eaed95b9-f2be-45f3-a37d-46928168bc10&targetUrl=https%3A%2F%2Fdynamicforms.ngwebsolutions.com%2FSubmit%2FForm%2FStart%2F53b8369e-0502-4f36-be43-f02a4202f612].

Faculty cannot drop students; this is always the responsibility of the student. The Registrar's Office will provide a deadline on the Academic Calendar for which the form must be completed. Once you submit the completed form to the Registrar's Office, you must go into Warrior Web and confirm that you are no longer enrolled. If you still show as enrolled, FOLLOW-UP with the

Registrar's Office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the drop deadline or fail to follow the procedure, you will receive an F in the course, which may affect your financial aid and/or VA educational benefits.

Academic Integrity

Texas A&M University -Central Texas values the integrity of the academic enterprise and strives for the highest standards of academic conduct. A&M-Central Texas expects its students, faculty, and staff to support the adherence to high standards of personal and scholarly conduct to preserve the honor and integrity of the creative community. Academic integrity is defined as a commitment to honesty, trust, fairness, respect, and responsibility. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. Academic misconduct is any act that improperly affects a true and honest evaluation of a student's academic performance and includes, but is not limited to, working with others in an unauthorized manner, cheating on an examination or other academic work, plagiarism and improper citation of sources, using another student's work, collusion, and the abuse of resource materials. All academic misconduct concerns will be referred to the university's Office of Student Conduct. Ignorance of the university's standards and expectations is never an excuse to act with a lack of integrity. When in doubt on collaboration, citation, or any issue, please contact your instructor before taking a course of action.

For more information regarding the Student Conduct process, [https://www.tamuct.edu/student-affairs/student-conduct.html].

If you know of potential honor violations by other students, you may submit a report, [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0].

Academic Accommodations

At Texas A&M University-Central Texas, we value an inclusive learning environment where every student has an equal chance to succeed and has the right to a barrier-free education. The Office of Access and Inclusion is responsible for ensuring that students with a disability receive equal access to the university's programs, services and activities. If you believe you have a disability requiring reasonable accommodations please contact the Office of Access and Inclusion, WH-212; or call (254) 501-5836. Any information you provide is private and confidential and will be treated as such.

For more information please visit our Access & Inclusion Canvas page (log-in required) [https://tamuct.instructure.com/courses/717]

Important information for Pregnant and/or Parenting Students

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and related guidance from US Department of Education's Office of Civil Rights, the Dean of Student Affairs' Office can assist students who are pregnant

and/or parenting in seeking accommodations related to pregnancy and/or parenting. Students should seek out assistance as early in the pregnancy as possible. For more information, please visit Student Affairs [https://www.tamuct.edu/student-affairs/index.html]. Students may also contact the institution's Title IX Coordinator. If you would like to read more about these requirements and guidelines online, please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

Title IX of the Education Amendments Act of 1972 prohibits discrimination on the basis of sex and gender–including pregnancy, parenting, and all related conditions. A&M-Central Texas is able to provide flexible and individualized reasonable accommodation to pregnant and parenting students. All pregnant and parenting students should contact the Associate Dean in the Division of Student Affairs at (254) 501-5909 to seek out assistance. Students may also contact the University's Title IX Coordinator.

Tutoring

Tutoring is available to all A&M-Central Texas students, on a remote online basis. Visit the Academic Support Community in Canvas to view schedules and contact information. Subjects tutored on campus include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Student success coaching is available online upon request.

If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, success coaching, or have any other question, contact Academic Support Programs at (254) 501-5836, visit the Office of Student Success at 212F Warrior Hall, or by emailing studentsuccess@tamuct.edu .

Chat live with a tutor 24/7 for almost any subject from on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log in and receive online tutoring support at no additional cost. This tool provides tutoring in over 40 subject areas except writing support. Access Tutor.com through Canvas.

University Writing Center

The University Writing Center (UWC) at Texas A&M University–Central Texas (TAMUCT) is a free service open to all TAMUCT students. For the Spring 2021 semester, all services will be online as a result of the COVID-19 pandemic. The hours of operation are from 10:00 a.m.-5:00 p.m. Monday thru Thursday with satellite hours Monday thru Thursday from 6:00-9:00 p.m. The UWC is also offering hours from 12:00-3:00 p.m. on Saturdays.

Tutors are prepared to help writers of all levels and abilities at any stage of the writing process. By providing a practice audience for students' ideas and writing, our tutors highlight the ways in which they read and interpret students' texts, offering guidance and support throughout the various stages of the writing process. While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. Whether you need help brainstorming ideas, organizing an essay, proofreading, understanding proper citation practices, or just want a quiet place to work, the UWC is here to help!

Students may arrange a one-to-one session with a trained and experienced writing tutor by

making an appointment via WCOnline [https://tamuct.mywconline.com/]. In addition, you can email Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu if you have any questions about the UWC and/or need any assistance with scheduling.

University Library

The University Library provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 250,000 eBooks and 82,000 journals, in addition to the 85,000 items in our print collection, which can be mailed to students who live more than 50 miles from campus. Research guides for each subject taught at A&M-Central Texas are available through our website to help students navigate these resources. On campus, the library offers technology including cameras, laptops, microphones, webcams, and digital sound recorders.

Research assistance from a librarian is also available 24 hours a day through our online chat service, and at the reference desk when the library is open. Research sessions can be scheduled for more comprehensive assistance, and may take place on Skype or in-person at the library. Assistance may cover many topics, including how to find articles in peer-reviewed journals, how to cite resources, and how to piece together research for written assignments.

Our 27,000-square-foot facility on the A&M-Central Texas main campus includes student lounges, private study rooms, group work spaces, computer labs, family areas suitable for all ages, and many other features. Services such as interlibrary loan, TexShare, binding, and laminating are available. The library frequently offers workshops, tours, readings, and other events. For more information, please visit our Library website [http://tamuct.libguides.com/index].

For Spring 2021, all reference service will be conducted virtually. Please go to our Library website [http://tamuct.libguides.com/index] to access our virtual reference help and our current hours.

OPTIONAL POLICY STATEMENTS

A Note about Sexual Violence at A&M-Central Texas

Sexual violence is a serious safety, social justice, and public health issue. The university offers support for anyone struggling with these issues. University faculty are mandated reporters, so if someone discloses that they were sexually assaulted (or a victim of Domestic/Dating Violence or Stalking) while a student at TAMUCT, faculty members are required to inform the Title IX Office. If you want to discuss any of these issues confidentially, you can do so through Student Counseling (254-501-5955) located on the second floor of Warrior Hall (207L).

Sexual violence can occur on our campus because predators often feel emboldened, and victims often feel silenced or shamed. It is incumbent on ALL of us to find ways to actively create environments that tell predators we don't agree with their behaviors and tell survivors we will support them. Your actions matter. Don't be a bystander; be an agent of change. For additional information on campus policy and resources visit the Title IX webpage [https://www.tamuct.edu/compliance/titleix.html].

Behavioral Intervention

Texas A&M University-Central Texas cares about the safety, health, and well-being of its students, faculty, staff, and community. If you are aware of individuals for whom you have a concern, please make a referral to the Behavioral Intervention Team. Referring your concern shows you care. You can complete the referral online [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=2].

Anonymous referrals are accepted. Please see the Behavioral Intervention Team website for more information [https://www.tamuct.edu/student-affairs/bat.html]. If a person's behavior poses an imminent threat to you or another, contact 911 or A&M-Central Texas University Police at 254-501-5800.

OTHER POLICIES

Read these carefully as I am strict with my policies.

Grading Policy and Point Breakdown. Grades in this course will be criteria-based on a number of activities including exams, discussion, and projects. This means that grades will not be curved and anyone achieving a 90% or above will receive an A in this course.

Grade Dispute Policy. Grading disputes must be put in writing (with justification such as supporting statements from the text or another credible source) and given to me no earlier than 24 hours after the assignment has been returned. I will consider your request carefully, but reserve the right to adjust your grade up or down.

Assignments. These will be varied in nature, but will consist of activities that cause the students to reflect upon the state of knowledge of the topic of the week, how that topic is perceived in the media, and/or analysis of specific research projects relevant to the subject. All assignments are to be turned in, on time (i.e. at class time on due date), to the CANVAS website. I will distribute instructions on how to do this. I will not accept e-mailed assignments of any kind.

Late Assignments. I expect all assignments to be turned in on time. Late assignments interfere with my ability to provide timely, detailed feedback, as well as with your ability to learn and process new material. Accordingly, any unauthorized late assignment will receive a 5% reduction in grade for each day it is late. No assignments will be accepted after it has been graded and returned.

ETS Exam. The ETS Field exam will be taken in the last two weeks of the semester. You are responsible for scheduling a time with the TAMUCT Testing Center no less than 5 business days before you plan to take the exam. You are responsible for providing your test scores to Dr. Erlandson when you are finished – you can take a screen shot or provide an official copy – it must have your name, date of exam and score.

- *There will be no bathroom breaks allowed during any exam. Be sure that you address this issue before beginning an exam.*

What I expect of you. To get the most out of this class, you are expected to conduct yourself in a professional manner, which includes contributing to class discussions, being punctual, and notifying me of absences in advance. Any inappropriate or offensive behavior of any kind (in class/lab/office or on assignments/exams) will be subject to a penalty commensurate with behavior.

Class Attendance. I expect that you attend each class session and arrive on time. If an unavoidable situation arises that prevents you from attending class, I expect that you also

promptly contact me to discuss the missed material and get the notes from a classmate. I will not distribute my notes to students as they are often abbreviated and do not contain the detail needed to sufficiently understand the material.

What you can expect of me. You can expect me to start and end class on time, be available through office hours, e-mail, and by appointment, be responsive to student suggestions for course improvement, answer questions to the fullest extent possible and/or direct you to appropriate resources, return graded assignments and exams within a reasonable time frame, and treat you with respect as future colleagues.

Discussion. The topics in this class may encompass a diversity of issues that merit in-depth thought and discussion. Since individuals will be expressing their opinions, I expect that will you respect others' contributions, as you would want them to do for you.

Credits and Workload expectations. For undergraduate courses, one credit is defined as equivalent to an average of two hours of learning effort per week (over a full semester) necessary for an average student to receive an average grade for the course. A student taking a four-credit class that meets for four hours a week should expect to spend an additional eight hours a week outside the classroom in order to earn an average grade.

Class Structure. Classes will involve a balance of active lecture and engaging learning activities (either in lab or in class). I believe that students learn the theories and concepts much better when they have an active role. I know that this may be new to some of you, but please keep an open mind and I know that you will get more out of this class because of it.

Copyright Notice

Students should assume that all course material is copyrighted by the respective author(s). Reproduction of course material is prohibited without consent by the author and/or course instructor. Violation of copyright is against the law and Texas A&M University-Central Texas' Code of Academic Honesty. All alleged violations will be reported to the Office of Student Conduct.

BS BIOLOGY SENIOR THESIS

We will use the general format for a scientific paper in this course; however as this is your capstone thesis report, I expect that you really explore the literature and develop your concluding ideas. ***Expect this paper to be at least 20 pages long with at least 10 of these dedicated to your Introduction Literature Review***. Scientific papers have an abstract, introduction, materials and methods, results, discussion and literature cited. Keep in mind that scientists often pay for a paper to be peer-reviewed and published (not the other way around). Peer-review means that all articles are read by other scientists (peers) who make editorial suggestions and ultimately decide whether a paper contains sound research and should be published.

Formatting:
Font: Times New Roman
Size: 12pt
Spacing: Double
Margins: 1 inch all around
Citations: Please use the Council of Scientific Editors (CSE) "Name, Year" citation style for your writing: https://writing.wisc.edu/handbook/documentation/doccse/nameyear/

The Abstract section:

Should be a brief summary of your entire paper. Use a little (1-2 sentences) from each section to make a clear, cohesive summary. Readers will decide from your abstract whether or not they will continue to read your entire research paper. This is typically around 250 words or so.

The Introduction/Literature Review section:

This section will be quite extensive as I expect that you will research your topic thoroughly using mostly peer reviewed, professional journals. Because this section is essentially a literature review paper, you are reviewing all that is currently known about your topic of interest. This includes past and present studies. Therefore, almost 100% of your sources will be peer reviewed. You are to examine the fundamental and applied research that has contributed to our knowledge of the subject. Be sure to introduce and define your topic broadly first, then give more detail and examples to demonstrate your points.
This will lead the reader to a logical introduction of your main thesis or topic. You should clearly describe the specific questions you chose to study. State what you did in a general way, e.g., "We investigated the effect of obesity on heart rate by comparing heart rates of people with different Body Mass Indices after they climbed stairs", but do not give away the specific details of your methods or results. Finally, state your specific hypothesis at the end of this section.

The Materials and Methods section:

The experiment has been completed by the time you turn in your thesis, so use past tense. This section includes a brief outline of the methods used in the experiments. The purpose of this section is to allow other experimenters to duplicate the methods you used, so it should be detailed enough so that someone else could read your report and repeat the experiment. However, you

should NOT include trivial details (i.e. "*we used test tubes that were 10cm long*").

Good Example:

"We exposed *E. coli* cells to 0, 15, 30, or 45 seconds of ultraviolet irradiation at a wavelength of 280nm. Cells from each irradiation treatment were diluted to 1:3 and 1:5 of their original concentration. One ml of each of these dilutions was plated on Luria broth nutrient agar and incubated overnight at 37°C. The number of colonies present in each plate was recorded."

Bad Example:

"Our lab bench received cells from treatment #1, and these were serially diluted, so that there were 2 different concentrations of bacteria to count on the petri dishes. Lab bench 2 received cells from treatment 2. These were also serially diluted, resulting in 2 different concentrations of bacteria to count."

The Results section:

The results section always starts with normal paragraph (text) format, NOT with tables or figures. You MUST first direct the reader's attention to EACH table and figure before they appear, indicate what they show, and summarize the important data in each.

Good Example of How to Begin the Results:

"The mean IQ of TAMUCT biology students was found to be higher than the mean IQ of Harvard students and of students from many colleges (Figure 1)".

As with all writing, the results should be organized into coherent logically organized paragraphs and sentences. Data are usually reported in paragraph form supplemented with visual figures and/or tables:

- Figure: a graph, picture, or diagram, and has a detailed legend at the top.
- Table: something that contains only numbers, and has a detailed legend at the top.

Do NOT discuss the implications of the results in this section, nor attempt to explain why various results occurred. Only the important points of each figure and table should be described paragraph format; do not reiterate the whole figure.

*Figures are to be inserted at the end of the paper after the Literature Cited section but before any appendices. Do NOT embed them in the text of your paper.

*Raw data is NOT reported in the Results. Readers are usually interested only in summarized data (means, standard deviations, totals, etc.).

The Discussion section:

This is usually the most important part of your paper. This is your chance to show your extensive knowledge and command of your topic. In this section I expect you to be original, cleverly interpret the results you obtained, and draw general conclusions from them. The discussion should be narrow in scope to begin and end broadly.

This is a typical order of topics which might occur in the Discussion:

Begin the discussion by briefly stating the major conclusions from the results. Explain what the results mean. Discuss whether the results SUPPORT or do NOT support your original hypothesis (es). Your experiment is really very limited in scope, so DO NOT claim that you have "proven" or "disproven" a hypothesis; you perhaps obtained some small bit of evidence to support a

hypothesis, or you provided some evidence which contradicts a hypothesis.
In next paragraph(s) expand your discussion of these results. You will want to compare and contrast them to results from other studies, which you should cite properly.
You may discuss sources of error in the experiment, but your BEST guess is that the results reflect reality. Students often feel that their discussion should consist mainly of an analysis of all the things that went wrong with the experiment. *I strongly discourage this approach*. Naturally all experiments have some weaknesses, but for the purposes of this exercise assume that your results are reasonable. It is OK to get negative results. You should, however, suggest additional experiments using better or different methods.
As the discussion continues it is important to offer some original ideas and interpretations. For example, discuss the implications or your results for the biology of the organism(s). For example, why did the behaviors you observe evolve? What does it mean ecologically? You may wish to suggest new experiments which would shed further light on the questions raised by your results.

The Literature Cited section:

This section should list all references mentioned in the text. Unlike English papers and other term papers, we do not use footnotes, we avoid direct quotations, and we do not include material from encyclopedic type resources (including websites). You will *mostly* rely on peer reviewed published scientific papers for your information. You should not have any books or journals listed in this section unless you have cited the author and year in the text of the paper. If you are unsure whether a source is legitimate, consult your instructor.

**Please use the Council of Scientific Editors (CSE) "Name, Year" citation style for your writing: https://writing.wisc.edu/handbook/documentation/doccse/nameyear/

The following hints will improve your writing:

1. Use the first person (I or we) to write more concisely.
2. Avoid long run-on sentences. We are trying to write concisely and clearly. Don't use twelve letter words when simpler ones will do just fine.
3. Be positive about your results. Say "the data show" instead of "the data suggest".
4. Genus and species names in Latin are always italicized or underlined. Only the first letter of the genus is capitalized. Ex. *Homo sapiens, Danaus plexippus*, etc.…
5. Number all pages and use the metric system. Write numbers as numerals when they are associated with measurement units (2 km), spell them out for numbers < 10 (five hamsters).
6. In general, DON'T use quotes. Instead, paraphrase the author and cite him/her. Quotes interrupt the flow of your text.
7. Scientific writing is formal communication. Don't use conversational language, colloquialisms or slang
8. Some frequently misused/misspelled words:
    a. affect/effect "Effect" is a noun (usually). "Affect" is always a verb. "The effect of their misuse will be that your grade will be affected by subtracting five points".

b. it’s/its "It's" is the conjunction "it is". "Its" is the possessive form
c. their/there I assume this is just carelessness, proofread your paper.
d. between/among Between refers to two things, while among refers to more than two.
e. fewer/less Use "fewer" if you can count the items, "less" if you can't. (less water, but fewer boats)
f. amount/number Use 'amount" if you can't count them, "number" if you can. (The amount of sand and the number of rocks)
g. oftentimes Drop the "times"; it's redundant.
h. different from / different than: Different from is correct; different than is not.
i. than/then “than” refers to a comparison – proofread your paper for mix-ups
j. Always put a zero in front of a naked decimal point (0.12, not .12).
k. The word data is plural and the word datum singular. *The data show that …..*

Thesis Grading

Topic Approval (1%)	_____	**Due January 28**
Experimental Design (3%)	_____	**Due February 4**
Introduction/Lit. Rev. Outline (2%)	_____	**Due February 11**
Introduction Ann. Outline (4%) (includes citations)	_____	**Due February 25**
Materials and Methods (5%)	_____	**Due March 4**
Intro + M&M (5%)	_____	**Due March 25**
Results and Discussion (5%)	_____	**Due April 22**
First Submission (25%)	_____	**Due April 29**

(Note: this is not a "rough" draft! You are expected to have a full paper submitted**)**

Final Submission (50%)	_____	**Due May 13**

See next page for Thesis Rubric

Category	Exceeds expectations	Meets expectations	Below expectations	Does not meet expectations	Score
Abstract	Clearly and consicely states paper's purpose and main results. Includes at least one sentence from each main section. Engaging and thought provoking.	Clearly and consicely states the paper's purpose and main results. Missing 1 section.	States the paper's purpose and main results. Missing 2 or more sections.	Absent, incomplete, or confusing.	5.0%
Introduction	Thoroughly addresses the topic. Engages reader. Logical progression from broad to narrow topic. Clearly states main hypothesis.	The introduction states the main topic and states main hypothesis.	The introduction states the main topic but does not adequately state main hypothesis.	There is no clear introduction of main topic and hypotheis is missing.	10.0%
Materials & Methods	Clear and detailed narrative of methods so reader can replicate study. Materials are included within text (not listed separately). Only essential information included. Mathematical analysis clearly stated.	Clear and detailed narrative of methods so reader can replicate study. Materials are included within text (not listed separately). Mathematical analysis stated.	Narrative of methods not adequately clear so reader can replicate study. Materials are listed separately. Mathematical analysis stated.	Vague narrative of methods. Materials are listed separately or no materials are indicated. No mathematical analysis stated.	10.0%
Results	Clearly and consicely states the results of the study including statistical analysis. Includes appropriate tables/figures to supplement statements. "Just the facts"; no interpretation or discussion of data.	Clearly and consicely states the results of the study including statistical analysis. Includes some tables/figures to supplement statements (may not be appropriate). May have little interpretation or discussion.	States some of the results of the study; missing some statistical analysis. Includes some tables/figures to supplement statements (may not be appropriate). May include interpretation or discussion of data.	Missing some results of the study; missing all statistical analysis. Tables/figures not included or no text included. May include interpretation or discussion of data.	20.0%
Discussion	The conclusion is engaging and restates the main results and thesis. In-depth discussion and elaboration of all sections of the paper. Relates topic back to 'real world' applications.	The conclusion restates the results. Cursory discussion and elaboration of all sections of the paper. Vaguely relates topic back to 'real world' applications.	The conclusion does not adequately restate results or the thesis. Brief discussion of the paper. May not relate topic back to 'real world' applications.	The conclusion does not adequately restate results or the thesis. Incomplete or confusing discussion of the paper. Does not relate topic back to 'real world' applications.	25.0%
Organization/Structural Development of Topic	Writer demonstrates logical and subtle sequencing of ideas through well-developed paragraphs; transitions are used to enhance organization.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	5.0%
Spelling/Punctuation	No errors in punctuation, capitalization and spelling.	Almost no errors in punctuation, capitalization and spelling.	Many errors in punctuation, capitalization and spelling.	Numerous and distracting errors in punctuation, capitalization and spelling.	2.5%
Grammar	No errors sentence structure and word usage.	Almost no errors in sentence structure and word usage.	Many errors in sentence structure and word usage.	Numerous and distracting errors in sentence structure and word usage.	2.5%
In-text citations	All facts are cited using primary literature or peer sources. Correct format with no errors	Some facts are cited. Correct format, very few errors.	Few facts are cited. Correct format, few errors	No in-text citations.	5.0%
Literature cited	Correct format with no errors. Includes more than 10 major references (e.g. peer reviewed science journal articles, books, and no more than two professional internet sites. No encyclopedic type references).	Correct format with few errors. Includes more than 5 major references (e.g. peer reviewed science journal articles, books, and no more than two professional internet sites. No encyclopedic type references).	Correct format with some errors. Includes more than 3 major references (e.g. peer reviewed science journal articles, books, and no more than two professional internet sites. No encyclopedic type references).	Not correct format and/or with many errors. Includes more than 0-3 major references (e.g. peer reviewed science journal articles, books, and no more than two professional internet sites. No encyclopedic type references).	5.0%
Figures and tables	Tables/figures numbered consecutively in separate series. Title is complete enough to be understood without referring to text. Legend, headings, and units of measure are included. Footnotes used as necessary to provide clarity with respect to: units of measure that do not fit in the heading, explanations of abbreviations and symbols, statistical significance of entries.	Tables/figures numbered consecutively in separate series. Title is complete. Legend, headings, and units of measure are included. Footnotes used to provide clarity.	Tables/figures numbered, but not sequentially. Title is incomplete. Legend, headings, and units of measure are not fully included. Footnotes used but do not provide enough clarity	Tables/figures not numbered. No title. Legend, headings, and units of measure are not included. Footnotes are not used but are needed.	10.0%
Total					100.0%

BIOL 4395 Oral Presentation

Assignment: Deliver a 20-25 minute oral presentation of your research paper topic. You will be timed and docked points for going under or over than the prescribed time limit. You will have 2 minutes for questions.

Demonstrate Expertise:

Speak with authority as you have spent more time than anyone else in the room studying this topic. Immerse yourself in the subject and become the expert. Good preparation will boost your confidence. Anticipate questions from your audience and be prepared to answer them fully.

Organization/Visual aids:

Overall: Your presentation should be in three parts, introduction, body and conclusion. In the introduction, tell your audience what you are going to tell them. In the body, tell them. In the conclusion, tell them what you already told them.

Slides: Keep your slides simple, neat and uncluttered. Make sure the font is large enough to be seen from the back of the room. Use bulleted points to keep yourself on track. Use transitions to maintain a smooth flow among slides and please use animations sparingly; do not use sound or any other fancy transitions as you will only end up distracting and, possibly, annoying your audience (aka. your instructor). Add pictures, graphs, and tables to enhance understanding of the topic but be sure it is readable.

Transitions: Be sure that your transitions are smooth; do not abruptly jump from one topic to another. Find a nice segue between topics. Practicing your talk out loud will help you with this.

Delivery:

Voice quality: Speak in a clear, loud voice so everyone in the room can hear you. Do not speak in monotone, show us your enthusiasm for your chosen topic. Practice, practice, and practice some more!

Eye Contact: If you have practiced, you should be able to maintain eye contact with your audience most of the time; this engages the audience and gives you a sense of their level of understanding.

Dissemination of information: Do not read from your slides; use them as a guide and a reminder of what you want to talk about. Add context and explanation beyond what is written on the slide. Do not read from notes; you will not be allowed them. You are expected to know your subject without the use of note cards (this is why you have bulleted points on screen). Avoid using “um”, “like”, and “you know”.

Attire: Present yourself in a professional manner. This includes proper, professional dress (i.e. shorts and flip flops are not appropriate for delivering a presentation). No hats. NO GUM!

Stance: Do not stand in front of your slides, blocking view. Avoid shifting your feet or rolling on your heels. Stand up straight and avoid swinging your arms or other nervous gestures. If you have practiced, you will be confident in your delivery.

Oral Presentation Rubric

Category	Exceeds expectations	Meets expectations	Below expectations	Does not meet expectations	Score
Language Use and Delivery	Effectively uses eye contact. Speaks clearly, effectively, and confidently using suitable volume and pace. Fully engages audience. Dresses appropriately. Selects rich and varied words for context and uses correct grammar.	Maintain eye contact. Speaks clearly and uses suitable volume and pace. Attempts to engage audience. Dresses appropriately. Selects words appropriate for context and uses correct grammar.	Some eye contact, but not maintained. Sometimes speaks unclearly. Occasionally engages audience. May dress inappropriately. Occasionally selects words inappropriate for context and uses incorrect grammar.	Uses eye contact ineffectively. Fails to speak clearly and audibly and uses unsuitable pace. Does not engage audience. Dresses inappropriately. Selects words inappropriate for context and uses incorrect grammar.	10%
Organization and Preparation	Clearly outlines structure of presentation. Maintains clear focus on topic. Effectively includes smooth transitions to connect key points. Ends with logical, effective, and relevant conclusion.	Outlines structure of presentation. Maintains focus on topic. Includes transitions to connect key points. Ends with coherent conclusion based on evidence.	Incompletely outlines structure of presentation. Somewhat maintains focus on topic. Includes some transitions to connect key points. Ends with a conclusion based on evidence.	Does not outline structure of presentation. Does not establish or maintain focus on the topic. Uses ineffective transitions that rarely connect points. Ends without a conclusion.	10%
Content	Clearly defines topic and significance. Supports topic and key findings with analysis of relevant and accurate evidence. Provides evidence of extensive, valid research with multiple, varied sources. Provides evidence of complex problem solving and critical thinking. Combines and evaluates existing ideas to form new insights.	Clearly defines topic. Supports topic and key findings with evidence. Presents evidence of valid research with multiple sources. Provides evidence of problem solving and critical thinking. Combines existing ideas to form new insights.	Defines topic. Supports topic with evidence. Presents evidence of research with sources. Provides some evidence of problem solving and critical thinking. Combines existing ideas.	Does not clearly define topic. Does not supports topic with evidence. Presents little or no evidence of valid research. Shows little or no evidence of problem solving and critical thinking. Shows little or no evidence of the combination of ideas.	55%
Quality of Graphics/Slides	Consistent use of formatting: (fonts, sizes, color, punctuation…). Correct use of grammar with rich and varied sentence structures. Transition/animation/sound used effectively and smoothly.	Consistent use of formatting: (fonts, sizes, color, punctuation…). Correct use of grammar. Transition/animation/sound used effectively or smoothly.	Inconsistent use of formatting: (fonts, sizes, color, punctuation…). Some incorrect use of grammar . Transition/animation/sound not used effectively or smoothly.	Inconsistent use of formatting: (fonts, sizes, color, punctuation…). Significantly incorrect use of grammar. Transition/animation/sound not used.	10%
Questions and Answers	Demonstrates extensive knowledge of the topic by responding confidently, precisely, and appropriately to all audience questions and feedback.	Demonstrates knowledge of the topic by responding precisely and appropriately to questions and feedback.	Demonstrates some knowledge of the topic by responding accuratetly and appropriately to some questions and feedback.	Demonstrates incomplete knowledge of the topic by responding inaccuratetly and inappropriately to questions and feedback.	10%
Timing of Presentation	Keeps time within ± 1 minute.	Keeps time within ± 2 minutes.	Keeps time within ± 3- 4 minutes.	Keeps time within ± 5 minutes or more.	5%
Total					100%

Scientific Paper Critique Assignment

Each week you will be assigned a peer reviewed scientific paper to critique. Your assignment is to critically analyze these research studies for their scientific merit. You will be expected to thoroughly research the topic using peer reviewed sources and provide a detailed critique. In addition, each student will be required to lead one or more class discussions based on these critiques during the semester.

Please include the following in your paper:

1. Summarize, in your own words (not theirs), what the article is about. This description should be detailed enough to understand the basic theory and hypothesis of the research, the methods the researchers used to investigate (but do not include every single detail of the experiment – this is not a laboratory report), the main results and conclusions. Gear this toward a scientific audience (i.e. you may use scientific jargon if necessary).
2. Critically evaluate *each section* of the scientific research paper (abstract, introduction, materials and methods, results [incl. tables/figures], discussion, literature cited). Discuss potential flaws as well as things the author(s) included that you really liked. Was the introduction sufficient to provide enough background to allow you to fully understand what and why this study was conducted? Discuss the experimental methods and statistical analysis in terms of accuracy and appropriateness. Would you be able to replicate the experiment based on their description? Are the results clear, are the tables/figures appropriate and add clarity (and properly formatted)? Is the discussion complete and accurate based on prior research and the results obtained? What would you add/change? I expect you to be *very thorough* in your analysis.
3. Conclusion. Discuss the implications of how this science is reported including why the topic of this article important. Also, discuss how the research could have been better reported using specific examples.
4. Be sure to use the grading rubric below to help guide you in assuring a complete critique.

Scientific Paper Critique Assessment Rubric

Category	Exceeds expectations	Meets expectations	Below expectations	Does not meet expectations	Score
Summary of article	Clearly, consicely, and accurately describes the paper's purpose, methods, results, and main conclusions.	Describes the paper's purpose, methods, results, and main conclusions with few omissions and/or confusion.	Describes the paper's purpose, methods, results, and main conclusions with many omissions and/or confusion.	There is no clear description of the paper's purpose, methods, results, and main conclusions. Incomplete and/or confusing.	15.0%
Critical analysis	Shows extensive depth of knowledge by recognizing all of the weak or flawed areas in research methods, analysis, and/or interpretation. Clear, concise, and detailed analysis of paper.	Shows knowledge by recognizing some of the weak or flawed areas in research methods, analysis, and/or interpretation. Clear, concise, and detailed analysis of paper.	Shows knowledge by recognizing few of the weak or flawed areas in research methods, analysis, and/or interpretation. Somewhat clear and concise analysis of paper.	Shows lack of knowledge by not recognizing weak or flawed areas in research methods, analysis, and/or interpretation. Confusing and/or incomplete analysis of paper.	50.0%
Conclusion	Clearly and consicely integrates critical analysis with suggestions for improvement and implications for application in science.	Integrates critical analysis with suggestions for improvement and implications for application in science.	Poor integration of critical analysis with suggestions for improvement and little to no implications for application in science.	Incomplete or confusing. No integration of critical analysis with suggestions for improvement and no implications for application in science.	15.0%
Organization/Structural Development of Topic	Writer demonstrates logical and subtle sequencing of ideas through well-developed paragraphs; transitions are used to enhance organization.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	5.0%
Spelling/Punctuation	No errors in punctuation, capitalization and spelling.	Almost no errors in punctuation, capitalization and spelling.	Many errors in punctuation, capitalization and spelling.	Numerous and distracting errors in punctuation, capitalization and spelling.	2.5%
Grammar	No errors sentence structure and word usage.	Almost no errors in sentence structure and word usage.	Many errors in sentence structure and word usage.	Numerous and distracting errors in sentence structure and word usage.	2.5%
In-text citations	All facts are cited using primary literature or peer sources. Correct format with no errors	Some facts are cited. Correct format, very few errors.	Few facts are cited. Correct format, few errors	No in-text citations.	5.0%
Literature cited	Done in the correct format with no errors. Includes more than 3 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Done in the correct format with few errors. Includes more than 2 major references (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Done in the correct format with some errors. Includes more than 1 major reference (e.g. peer reviewed science journal articles, books, and no more than professional two internet sites. No encyclopedic type references).	Does not include any major references.	5.0%
Total					100.0%