

**BIOL 4389-120 CRN 60308, Independent Study**

**Summer 2023 rev. 06.12.2023**

Texas A&M University-Central Texas

**COURSE DATES, MODALITY, AND LOCATION**

**Mode of instruction and course access:**

This course meets face-to-face on the TAMUCT campus for 10 weeks during the Summer 2023 semester. Supplemental materials may be included in the A&M-Central Texas Canvas Learning Management System [<https://tamuct.instructure.com>]. Based on the Carnegie unit, expect for every one credit hour in which you enroll, you will spend approximately two to three hours outside of class studying or doing homework.

**INSTRUCTOR AND CONTACT INFORMATION**

**Instructor:** Dr. Weiser Erlandson

**Office:** 302H Beck Family Heritage Hall

**Phone:** 254-519-5723

**Email:** [laura.erlandson@tamuct.edu](mailto:laura.erlandson@tamuct.edu)

**Office Hours:** By appointment, in person, or virtual

**Course Times:** TBD with the instructor

**Student-instructor interaction**

This course will meet *on campus TBA*. You may contact me through email or CANVAS. Expect me to respond back to any emails within 48 hours (business days only). If I do not, please check back with me to be sure that your email was not lost in transit.

**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](mailto:laura.erlandson@tamuct.edu)

**Office Hours:**

Office Hours: by appointment

**Student-instructor interaction:**

This course will meet face to face in the classroom on Tuesday and Thursday. All on-campus interactions will comply with the current safety guidelines to ensure the reduction of the possibility of COVID-19 transmission.

***In the event that COVID-19 precipitates a lockdown of campus,*** all lectures will be synchronous via WebEx, labs will be recorded and available to students on the CANVAS LMS. All exams, including laboratory exams will be administered via CANVAS LMS using Proctorio.

## **Emergency Warning System for Texas A&M University-Central Texas**

**SAFEZONE.** SafeZone provides a public safety application that gives you the ability to call for help with the push of a button. It also provides Texas A&M University-Central Texas the ability to communicate emergency information quickly via push notifications, email, and text messages. All students automatically receive email and text messages via their myCT accounts.

Downloading SafeZone allows access to push notifications and enables you to connect directly for help through the app.

You can download SafeZone from the app store and use your myCT credentials to log in. If you would like more information, you can visit the [SafeZone](http://www.safezoneapp.com) website [www.safezoneapp.com].

To register SafeZone on your phone, please follow these 3 easy steps:

1. Download the SafeZone App from your phone store using the link below:
  - o [iPhone/iPad](https://apps.apple.com/app/safezone/id533054756): [https://apps.apple.com/app/safezone/id533054756]
  - o [Android Phone / Tablet](https://play.google.com/store/apps/details?id=com.criticalarc.safezoneapp)  
[https://play.google.com/store/apps/details?id=com.criticalarc.safezoneapp]
2. Launch the app and enter your myCT email address (e.g. {name}@tamuct.edu)
3. Complete your profile and accept the terms of service

**For updates on COVID information**, please monitor the University [website](https://www.tamuct.edu/covid19/) [https://www.tamuct.edu/covid19/]

## **COURSE INFORMATION**

### **Course Overview and Description**

ST: Soil Composition for Monarch Habitats – Investigation of the soil composition on the Texas A&M University - Central Texas campus during the Summer season to assess the optimal placement of Monarch Butterfly habitats. Prerequisite(s): BIOL 1407.

### **Student Learning Outcomes:**

Students will:

- a. understand the procedures of scientific research
- b. be able to formulate a question based on observations
- c. design and implement an experiment to test a hypothesis
- d. be able to disseminate research data orally and through a written report

### **Required Reading and Textbook(s)**

TBA

## **COURSE REQUIREMENTS**

Course Requirements:

Literature Review (SLOs a-d)	60%
Materials and Methods (SLOs c-d)	30%
Participation (SLO c)	10%

### **Literature Review and Materials & Methods**

During this semester, you are required to design and conduct an original experiment and submit a report based on your experiment. You will be working on this over the duration of the semester.

This process will require you to take advantage of the TAMUCT Writing Center (4th Floor, Warrior Hall). Detailed instructions and an assessment rubric are attached to the end of this syllabus and available as **Writing tutorials available on CANVAS**.

*\*\*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, clean up, taking data, and care of any research animals/plants you have for the duration of the semester.\*\**

### **Grading Criteria Rubric and Conversion**

**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*

## COURSE OUTLINE AND CALENDAR

### Complete Course Calendar – dates are subject to change

- a. Weekly meetings will consist of student research and research discussions

### Important University Dates

<https://www.tamuct.edu/registrar/academic-calendar.html>

## 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, Firefox, Edge, or Safari browsers. Canvas will run on Windows, Mac, Linux, iOS, android, or any other device with a modern web browser. **Canvas no longer supports any version of Internet Explorer.**

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/>] by clicking on the “TAMUCT Online Canvas” tile. You will then log in through our Microsoft portal.

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

### Canvas Support

Use the Canvas Help tab, located at the bottom of the left-hand menu, for issues with Canvas. You can search the support articles or use the Email, Call, or Chat buttons at the bottom of the support pop-up to contact the Canvas Help Desk.

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. If the course requires identity verification or proctored testing, the technology requirements are: Any computer meeting the minimum computing requirements, plus web camera, speaker, and microphone (or headset). Proctorio requires use of the Chrome web browser with their custom plug in installed.

### 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](mailto:helpdesk@tamu.edu)

Phone: (254) 519-5466

[Web Chat](http://hdc.tamu.edu): [<http://hdc.tamu.edu>]

*Please let the support technician know you are an A&M-Central Texas student.*

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## UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES

### 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 Warrior Center for Student Success, Equity 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](https://tamuct.instructure.com/courses/717) Canvas page (log-in required) [https://tamuct.instructure.com/courses/717]

### **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. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. All academic misconduct concerns will be referred to the Office of Student Conduct. 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), [https://www.tamuct.edu/student-affairs/student-conduct.html].

If you know of potential honor violations by other students, you may [submit a referral](https://cm.maxient.com/reporting.php?TAMUCentralTexas), [https://cm.maxient.com/reporting.php?TAMUCentralTexas].

### **Drop Policy**

If you discover that you need to drop this class, you must complete the [Drop Request](https://federation.ngwebsolutions.com/sp/startSSO.ping?PartnerIdpid=https://eis-prod.ec.tamuct.edu:443/samlSSO&SpSessionAuthnAdapterId=tamuctDF&TargetResource=https%3a%2f%2fdynamicforms.ngwebsolutions.com%2fSubmit%2fStart%2f53b8369e-0502-4f36-be43-f02a4202f612) Dynamic Form through Warrior Web.

[https://federation.ngwebsolutions.com/sp/startSSO.ping?PartnerIdpid=https://eis-prod.ec.tamuct.edu:443/samlSSO&SpSessionAuthnAdapterId=tamuctDF&TargetResource=https%3a%2f%2fdynamicforms.ngwebsolutions.com%2fSubmit%2fStart%2f53b8369e-0502-4f36-be43-f02a4202f612].

Faculty cannot drop students; this is always the responsibility of the student. The Records and Admissions Office will provide a deadline on the Academic Calendar for which the form must be completed. Once you submit the completed form to the Records and Admissions 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 Records and Admissions 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.

### **Pregnant and/or Parenting Students Rights and Accommodations**

A&M-Central Texas supports students who are pregnant, experiencing pregnancy-related conditions, and/or parenting. In accordance with requirements of [Title IX and related guidance](#)

[from US Department of Education's Office of Civil Rights](#), the Associate Dean in the Division of Student Affairs, (254) 501-5909, can assist students who are pregnant, experiencing pregnancy-related conditions, and/or parenting by provide flexible and individualized reasonable accommodations. Students should seek out assistance as early in the pregnancy as possible through the [Pregnancy & Parenting webpage](https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html) [https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html]. For more information, please visit [Student Affairs](https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html) [https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html]. 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](#) specifically prohibits discrimination against a student based on pregnancy, childbirth, false pregnancy, termination of pregnancy, or recovery from any of these conditions [https://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.html].

Students experiencing any form of discrimination due to any of these conditions are encouraged to reach out to the Title IX Coordinator, 254.519.5716, titleix@tamuct.edu, Founders Hall 317B, or the Associate Dean of Student Affairs, 254.501.5909, Warrior Hall 105.

### **Title IX Rights and Reporting Responsibilities**

A&M-Central Texas is committed to creating a safe and open learning environment for all students. If you or another student has experienced any form of gender discrimination or sexual misconduct, including sexual harassment, sexual assault, dating/domestic violence, and/or sex-based stalking, help and support are available. Our university strongly encourages all members of our campus community to report incidents and seek support for gender discrimination and sexual misconduct through the Title IX Office. You may contact the Title IX Office at 254.519.5716, titleix@tamuct.edu, Founders Hall 317B, or learn more by visiting the [Title IX webpage](https://www.tamuct.edu/compliance/titleix.html) [https://www.tamuct.edu/compliance/titleix.html].

Please be aware that that under [Title IX](#), [Texas Senate Bill 212](#), and [System Regulation 08.01.01](#), [https://policies.tamus.edu/08-01-01.pdf] all university employees are mandated reporters and are required to disclose information about suspected or alleged violations as listed above and defined in System Regulation 08.01.01. If the Title IX Office receives information about an incident, they will reach out to offer information about resources, rights, and procedural options as a member of the campus community. Although I have an obligation to report, you will, in most cases, control how your case will be handled. When working with the Title IX Office you will have access to resources and accommodations but also have the opportunity to express if you wish to move forward with an investigation. Our goal is to make sure you are aware of the options available to you as a student. Community members are not required to respond to this outreach.

If you or another student wishes to speak to a confidential employee who does not have this reporting responsibility, you can contact the [Student Wellness & Counseling Center](https://www.tamuct.edu/student-affairs/student-counseling.html), [https://www.tamuct.edu/student-affairs/student-counseling.html], 254.501.5955, or swacc@tamuct.edu, located in Warrior Hall Room 207L or the Student Support Advocate, 254.501.5978 or ssa@tamuct.edu, located in founder Hall Room 317D.

## **Tutoring and Success Coaching**

Tutoring and success coaching services are available to all A&M-Central Texas students, both virtually and in-person.

To schedule tutoring sessions or view tutor availability, please contact [Warriorcenter@tamuct.edu](mailto:Warriorcenter@tamuct.edu) or visit Warrior Hall, 111.

If you have questions about these or other academic support services or are interested in becoming a tutor, please contact the Warrior Center for Student Success, Equity and Inclusion at (254) 501-5836, email us at [WarriorCenter@tamuct.edu](mailto:WarriorCenter@tamuct.edu). You are welcome to visit the Warrior Center at Warrior Hall, suite 212.

*Chat live with a remote 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 Library & Archives**

The University Library & Archives provides many services in support of research across campus and at a distance. We offer over 350 electronic databases containing approximately 631,525 eBooks and 75,149 journals, in addition to the 97,443 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 virtually through WebEx, Microsoft Teams or in-person at the library. [Schedule an appointment here](https://tamuct.libcal.com/appointments) [https://tamuct.libcal.com/appointments]. 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 workspaces, 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](https://tamuct.libguides.com/index) [https://tamuct.libguides.com/index]

## **University Writing Center**

University Writing Center: For the summer semesters, all University Writing Center (UWC) tutoring services are entirely online. The hours of operation are from 10:00 a.m.-4:00 p.m. Monday through Thursday with additional hours Monday through Thursday nights 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. While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. 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. In addition, students may work independently in the UWC by checking out a laptop that runs the Microsoft Office suite and connects to WIFI, or by consulting our resources on writing, including all of the relevant style guides. 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 [WCOOnline](https://tamuct.mywconline.com/) [https://tamuct.mywconline.com/]. In addition, you can email Dr. Bruce Bowles Jr. at [bruce.bowles@tamuct.edu](mailto:bruce.bowles@tamuct.edu) if you have any questions about the UWC, need any assistance with scheduling, or would like to schedule a recurring appointment with your favorite tutor.

## **OTHER 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 Wellness and 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) [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/reporting.php?TAMUCentralTexas].

Anonymous referrals are accepted. Please see the [Behavioral Intervention Team](#) website for more information [https://www.tamuct.edu/bit]. If a person's behavior poses an imminent threat to you or another, contact 911 or A&M-Central Texas University Police at 254-501-5805.



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## INSTRUCTOR 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.** There are weekly homework assignments (CANVAS quizzes) based on each chapter we cover in class. In addition, there may be additional assignments throughout the semester; these will be announced and given sufficient time to complete. All assignments are to be turned in, on time, 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 one week past the due date.

**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, including a Behavioral Intervention Team report to Student Services.

**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 independent research activities (in lab).

### **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.

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## 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.

For detailed instructions see the following *writing tutorials in your CANVAS shell*:

1. The Outline/Annotated outline
2. The Term paper/Literature review
3. The Laboratory report/Research paper
4. Citations

### **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 of 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) "Author, Year" citation style for your writing:**  
<https://writing.wisc.edu/handbook/documentation/doccse/nameyear/>

Reference the Citing References tutorial in your CANVAS shell\*

### **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 .....*