

BIO 497L Environmental Studies Laboratory Spring 2025

Laboratory Handouts at: BlackBoard for BIO 497L

Tuesday and Thursday, 3:30-5:30pm, Room 311 Hope Hall

INSTRUCTOR:

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Office Hours: MWF 10:00-10:50 am and by appointment

LABORATORY SCHEDULE

<u>Date</u>	<u>Experiment</u>	<u>Activity and Assignments</u>
16-Jan	TH #1	Introduction to course Population Growth, Resource Use and Ecological Footprint Seminar presentations in class on January 30 Biology Seminar 4:00-5:00pm LR2 NMM
21-Jan	T #2	Discuss experiment on temperature effects on bean beetle microbiomes. Biology Seminar 4:00-5:00pm LR2 NMM
23-Jan	TH #2	Bean beetle microbiome diversity (isolate samples). Biology Seminar 4:00-5:00pm LR2 NMM
28-Jan	T #2	Biology Seminar 2:45-3:50pm LR2 NMM. Lab will start at 4:00pm: Bean beetle microbiome diversity (isolate samples)
30-Jan	TH #2	Bean beetle microbiome diversity (DNA extraction) Seminar presentations on Ecological Footprint Discussion on research poster format and evaluating posters
4-Feb	T #2	Bean beetle microbiome diversity (DNA extraction)
6-Feb	TH #2	Bean beetle microbiome diversity (discuss community ecology analysis) Seminar presentations on Ecological Footprint
11-Feb	T #2	Bean beetle microbiome diversity (analysis and discussion)
13-Feb	TH #2	Bean beetle microbiome diversity (research poster prep) Research Poster 1 due Monday 3 March BlackBoard
18-Feb	T #3	Drinking water purification (building models to evaluate)
20-Feb	TH #3	Drinking water purification
25-Feb	T #3	Drinking water purification
27-Feb	TH #3	Drinking water purification

<u>Date</u>	<u>Experiment</u>	<u>Activity and Assignments</u>
4-Mar	T	Research Poster 1 Presentations
6-Mar	TH	Research Poster 2 assignment
11&13-Mar		Spring Break – No Classes
18-Mar	T #4	Alternatives to carbon fuels 1 – PEM Fuel Cells Demo
20-Mar	TH #4	Discussion on Hydrogen – based energy systems
25-Mar	T #5	Alternatives to carbon fuels 2 - Solar Power efficiency
27-Mar	TH #5	Solar Power efficiency – discuss results
1-Apr	T #6	Lighting efficiency study (design and conduct)
3-Apr	TH #6	Lighting efficiency study (discuss results)
8-Apr	T	Discussion on a Net Zero Home
10-Apr	TH	Net Zero Home Research Plans
		Final Laboratory Seminar Assignments Distributed
13-Apr	T	Net Zero Home (create simulation analysis)
17-Apr	TH	Net Zero Home (prepare findings)
22-Apr	T	Video on Climate Change (view and discuss)
24-Apr	TH	Research Poster 2 Presentations
29-Apr	T	Final Laboratory Seminars

Laboratory Manual

The laboratory handouts for this course are available at the course BlackBoard site. Download and read the upcoming laboratory protocol before the laboratory meeting. In addition to the laboratory book, you will need a hardbound composition book, pens, pencils, and USB flashdrive. You will only need one USB flash-drive for use in both laboratory and lecture.

Laboratory Notebook

Your hardbound laboratory notebook is the repository for all your laboratory notes, raw data records, calculations, data analysis results, and preliminary figures and tables. This notebook must be brought to every laboratory meeting and every field trip. Many of the experiments we perform required the pooling of data to create a class data set. Your classmates will be counting on you to keep neat, accurate, and up-to-date data records on each of the studies you perform.

Course Goals

Knowledge

Dynamics of Individual-Environment Interactions
Population Growth Patterns and Limits
Relationships between Pollution, Energy and Matter Flows in Nature
Human Energy and Material Resources, Alternatives and Consequences
Waste Management and Environmental Limits
Global Energy Flow, Pollution and Climate Change

Skills

Scientific Research, Designing and Conducting Experiments
Mathematical Modeling
Statistical Analysis
Writing – Poster Preparation
Speaking – Seminar Presentation

Course Grading

Laboratory Attendance (28 x 5 points each)	140 points
Two Research Posters (110 points each)	220 points
Ecological Footprint Seminar	100 points
Final Laboratory Seminar	100 points
Quizzes, Brief Reports, Laboratory Notebook	140 points
Total =	700 points

Letter grades will be assigned as described below:

A	=	90	to	100%
A-	=	88	to	89%
B+	=	86	to	87%
B	=	80	to	85%
B-	=	78	to	79%
C+	=	76	to	77%
C	=	70	to	75%
C-	=	68	to	69%
D+	=	66	to	67%
D	=	60	to	65%
D-	=	58	to	59%
F	=	57% and less		

Laboratory Seminars

Each of you will prepare and present a brief (10 minutes) seminar on your Ecological Footprint. You will be given specific instructions in class and questions that must be addressed in your presentation. An additional seminar will be on one of the studies (or a part of one of the studies) we conduct during the semester (Final Laboratory Seminar). In each case, you will be required to prepare a PowerPoint presentation and present your seminar to the class. You should be prepared to answer questions about the study you present, the assertions you make and your conclusions. You must be able to discuss the meaning of the results and how the results address the question and hypotheses posed in the study you are presenting. The Final Laboratory Seminars are meant to help us review the work we have done the semester and put it all into a larger context. Think about how different studies are interrelated.

Your seminars will be evaluated for clarity, organization, and accuracy. Each presentation will count for 100 points. We will use the same seminar evaluation rubric used for Senior Seminar in Biology. I will be happy to discuss the format and content of your seminars prior to your presentations. Please dress as you normally would for the laboratory. If necessary, I will conduct an in-class demonstration the slide format and presentation method I expect of you.

Final Laboratory Seminar assignments also will be distributed in class at least two weeks prior to the presentation times in the last two class meetings. We will begin promptly at the start of the scheduled time and late arrivals will result in a 25-point penalty.

Research Posters

Two Research Posters will be due the week after you complete specific laboratory studies. The posters you will prepare are to be organized in much the same manner as a Research Report. Each poster must have a descriptive title and your name should be given under the title. There should be an Introduction, Methods, Results, Discussion and Literature Cited. Each Research Poster should be organized as follows:

- a. Title (give your poster a descriptive title) and include your name after the title line.
- b. Introduction (statement of purpose and introduction to the phenomenon being investigated)
- c. Methods (a concise description of the treatments performed and the manner in which data were collected). This section is never a list of materials.
- d. Results (**prose** description of data, and in tables or figures)
- e. Discussion and Conclusions (specific discussion-interpretation of the observed results)
- f. Literature Cited (a minimum of five references must be cited)

Unlike a Research Report, the text in a poster is best kept to a minimum and may be presented as bulleted phrases. Use graphs, tables and other illustrations to show your findings and make the poster visually interesting. A sample poster may be put on display to give you an example to emulate. The evaluation rubric for the Research Poster is given

at the end of this syllabus. A part of your poster grade is based on your responses to poster interview questions that are at the end of this syllabus.

Laboratory Attendance

The most important work we will do this semester is the actual design and conduct of experiments. Therefore, your attendance and participation in our weekly meetings will constitute approximately 20% of your grade in this course. It is virtually impossible to make-up laboratory activities. The first excused absence (for an unscheduled absence with a note from the Academic Dean or Dean of Students) from a laboratory meeting will simply excuse you from the work conducted in that laboratory period. No make-up will be given. A second excused absence from a laboratory meeting will result in an Incomplete. All laboratory work that was excused must be completed in the following semester to remove the grade of Incomplete. Scheduled absences for such activities as athletic teams, attending an interview, or studying for another course will result in the loss of 10 points for each absence (even with a valid excuse). Class will begin promptly at 2:00 pm and late arrivals will not be permitted (the door will be locked). All students in this course are expected to be present for the entire scheduled class time. If you have a scheduling conflict, you will be unable to complete this course. Schedule your appointments for times other than laboratory time.

Students are expected to attend each class meeting. **Students who meet the threshold of (one) 1 unexcused hour of class time for each credit hour assigned to the course** will be referred to the Office of Student Success and may be administratively withdrawn from the course. Therefore, a student with two (2) unexcused hours absent from a 2 credit hour course or a student with three (3) unexcused hours absent from a 3 credit hour course is in violation of the attendance policy. **Failure to meet minimum attendance requirements may result in the loss of the student's financial aid in accordance with Federal financial aid requirements.**

Each class meeting is important, so class attendance will be taken from the first day of class. Students who enroll late, miss classes early in the semester, or are withdrawn and then re-enter the class are students who may need intervention. Our goal is to work with divisional advisors to intervene early and effectively to support all students.

Laboratory Safety

- No food or drink is to be brought into the laboratory under any circumstances.
- No cell phone use in the laboratory (turn your cell phone off).
- Dress appropriately! Fancy clothes invariably get stained in a laboratory, and ruined in the field. Closed toe shoes must be worn at all times.
- Clean-up spills when they occur. At the end of the laboratory, clean your area, and put equipment and supplies away as instructed. Laboratory clean-up is necessary at the end of each class. Sinks are not to be left containing any waste or glassware. **We always leave our laboratory cleaner than we found it.**

Academic Honesty

Although much of the work we do in this course will require that we pool data and construct a single class data set, each of you is expected to do your own work on all assignments, quizzes, and posters. You will be expected to make your own figures and tables and write your own prose for these assignments. Copying or paraphrasing someone else's prose (from a fellow student or a published reference), using someone else's figure or table (even if it is based on the same data as a figure or table you could make) or submitting someone else's work as your own is plagiarism. Simply copying and pasting the statistical analysis output that I send to you for each experiment is not acceptable for presentation in either your poster or your seminar presentation. Giving a literature citation is not sufficient. **I require that you submit work that you have written yourself in your own words.** Writing with long quotations (even if fully referenced) will not be accepted. Leaving your work on a laboratory computer hard-drive so other students may freely copy that work is not advised, as it will result in accusations of plagiarism against both you and dishonest students who submit your work as their own. Using an AI system to write prose for you is not acceptable and will be treated the same as plagiarism. **At a minimum, plagiarism will result in a grade of zero for the assignment in question and a report to the Dean of Students.**

Morehouse College students are expected to conduct themselves with the highest level of ethics and academic honesty at all times and abide by the terms set forth in the Student Handbook and Code of Conduct. Instances of academic dishonesty, including, but not limited to plagiarism and cheating on examinations and assignments, are taken seriously and may result in a failing grade for the assignment or course and may be reported to the Honor and Conduct Review Board for disciplinary action.

Disability Accommodation

Morehouse College is an equal opportunity employer and educational institution. The College makes reasonable accommodations for all qualified individuals with disabilities. Any student requesting academic accommodations based on his disability is required to register with our Student Counseling & Disability Center (the "Center") at 104 Sale Hall Annex, Suite 100 every semester. A disability accommodation letter can be obtained from ODS. Students are required to provide a copy of the disability accommodation letter to each of their professors upon approval of their accommodations. Please contact our Coordinator of Disability and Counseling Services with any questions at (470) 639-0231.

Disclaimer

A syllabus is not a contract between instructor and student, but rather a guide to course procedures. The instructor reserves the right to amend the syllabus when conflicts, emergencies or circumstances dictate. Students will be duly notified.

Inclement Weather Policy

In the event of inclement weather, the College will announce any closures via the emergency notification system and/or through local news outlets. Absent an official closure, students are not excused from attending class due to weather and any absences will be considered unexcused.

BIO 497L Environmental Studies Laboratory, Research Poster Evaluation

Poster Title _____

Poster Author _____ Score (_____ 110 points possible)
Poster (80 pts possible) _____
Interview (30 pts possible) _____

Title (_____ out of 5 points possible)

Title describes both the question and the system being studied: 5 points
Title describes either the question or the system: 2 points
Title not descriptive, such as “Experiment #1” or missing: no points

Introduction (_____ out of 15 points possible)

Statement of question addressed, statement of hypotheses to be tested, and context for the current study provided: 15 points
Statement of question and alternative hypotheses given, but context missing: 7 points
Statement of alternative hypotheses missing: 5 points
Statement of question missing: no points

Methods (_____ out of 5 points possible)

Description of the treatments including the control and a summary of the study protocol: 5 points
Description of treatments and summary of protocol, but control not identified: 3 points
Descriptive summary of protocol given but treatments not described: 2 points
Description of methods limited to a list of materials: 1 point
Methods missing: no points

Results (_____ out of 20 points possible)

Statistical summary of findings (average values, total counts for each treatment) in prose **and** in the form of graphs or tables, and a prose description of the findings: 20 points
Statistical summary of findings (average values, total counts for each treatment) in prose **and** in the form of graphs or tables, but no prose description of the findings: 10 points
Statistical findings only in the form of graphs or tables: 5 points
Raw data presented without statistical summaries: no points

Discussion (_____ out of 20 points possible)

Interpretation of results to reject hypotheses and address the question posed in the Introduction, **and** provide a broader context on the meaning of the findings: 20 points
Interpretation of results to reject hypotheses and address the question posed in the Introduction, but no context on the meaning of the findings provided: 10 points
Interpretation of results to reject hypotheses provided but the question posed in the Introduction not addressed: 5 points
Interpretation of results to reject hypotheses and address the question posed in the Introduction not provided: no points

Literature Cited (_____ out of 5 points possible)

Scientific literature (minimum of five books or journal articles, government or university researcher websites) cited in both the Introduction and the Discussion to provide context. In text, citations use Author, year method and full citation provided in Literature Cited: 5 points

Scientific literature cited in both the Introduction and the Discussion to provide context. In text, citations use Author, year method, but Literature Cited missing or contains references not cited in the prose of the Poster: 4 points

Scientific literature cited in either the Introduction or the Discussion but not both. In text, citations use Author, year method: 3 points

Scientific literature not cited in prose of Poster, but a Literature Cited or References list provided: 2 point

Scientific literature not cited and Literature Cited or References missing: no points

Format (_____ out of 10 points possible)

Poster is appropriately organized with Introduction, Results, Discussion, and Literature Cited sections. Writing is for an informed external audience: 10 points

Poster is appropriately organized with Introduction, Results, Discussion, and Literature Cited sections. Audience inappropriately focused on the instructor or the class context: 5 points

Poster is organized with Results and Discussion confused or one section of Poster format missing: 2 point

Poster is not organized with Introduction, Results, Discussion, and Literature Cited sections: no points

Academic Honesty

If any one of the following is true, the score for the entire assignment is zero.

Direct quotations from another student or a published source without quotations marks **or** without attribution.

Direct quotations (with minor editing) presented without quotation marks **or** without attribution.

Extensive use (more than one sentence) of direct quotations with quotation marks and attribution.

Reprinting graphs or tables prepared by another student.

Reprinting graphs or tables from published source without attribution.

BIO 497L Environmental Studies Laboratory, Research Poster Interview

Poster Title _____

Poster Author _____ Score (_____ 30 points possible)

What question did your experiment address?

- 5 points: Concisely stated the experimental question.
- 3 points: Correctly stated the experimental topic but stated a question not addressed by the experiment conducted.
- 1 point: Only stated the general topic of the experiment.
- 0 points: Could not state the experimental topic.

What was the null hypothesis?

- 5 points: Clearly stated the null hypothesis.
- 3 points: Stated an alternative hypothesis.
- 1 point: Stated an hypothesis not addressed by the experiment.
- 0 points: Could not state an hypothesis.

What were the treatments in the experiment? What was (were) the control treatment(s)?

- 5 points: Clearly stated the experimental and control treatments.
- 3 points: Clearly stated either the experimental or control treatments but not both.
- 1 point: Incorrectly described the treatments.
- 0 points: Could not state any treatments.

Summarize the results of your experiment and the statistical tests of our results.

- 5 points: Described a) data means or total outcomes b) comparing controls to treatments and c) noted whether differences were statistically significant.
- 3 points: Described two of the above.
- 1 point: Described one of the above.
- 0 points: Could not describe any of the above.

What is the main conclusion from your study?

- 5 points: Clearly and concisely stated conclusions.
- 3 points: Conveyed the main conclusion, but lacked clarity
- 1 point: Only restated the results.
- 0 points: Response addressed neither results nor conclusions.

Based on your conclusions, what future experiment(s) would you propose?

- 5 points: Clearly stated at least one potential future experiment related to the conclusions.
- 3 points: Stated at least one future experiment related to the topic but not related to the conclusions.
- 1 point: Stated at least one experiment but not related to the current experimental topic.
- 0 points: Could not propose any future experiments.

Biology Seminar Evaluation 2024

Evaluator Name: _____

Date: _____

Presenter Name: _____

PRESENTATION EVALUATION RUBRIC

	1	2	3	4	5
BACKGROUND AND HYPOTHESIS OR OBJECTIVE	Background was not stated Hypothesis/Objective was not stated	Background was not clear or appropriately linked to the Hypothesis/Objective Hypothesis/Objective was not clear or relevant to the project	Background was not clear or was incomplete Hypothesis/Objective was clear but not appropriately linked to the Background	Background was clear and relevant to the Hypothesis/Objective but included relevance beyond project's scope Hypothesis/Objective was clear and appropriately linked to the Background	Background was clear and provided a relevant and concise overview of previous research that informed the project's Hypothesis/Objective Hypothesis/Objective was clear and appropriately linked to the Background
METHODS (Study Participants, Research Design, Procedures)	Methods were not stated	Methods were not clear or relevant to Hypothesis/Objective	Methods were appropriately linked to the Hypothesis/Objective but lack relevant information to fully understand what was done	Methods were clear and appropriately linked to the Hypothesis/Objective with sufficient details to understand what was done	Methods were clear and appropriately linked to the Hypothesis/Objective with a clear rationale and comprehensive details to fully understand what was done
RESULTS	Results were not provided	Results were provided but lacked sufficient data to address the Hypothesis/Objective Data were difficult to comprehend	Results included sufficient data to address the Hypothesis/Objective Data were difficult to comprehend	Results included sufficient data to address the Hypothesis/Objective Data were sufficient to comprehend	Results included sufficient amounts of high quality data to address the Hypothesis/Objective Data were clear, logical, thorough and easy to comprehend
CONCLUSIONS AND FUTURE WORK	Conclusions were missing Statement about Future Work was not included	Conclusions were included but little connection was made to the Results Statement about Future Work was provided but did not logically follow Results	Conclusions were reasonably supported by the Results but the relevance to the Hypothesis/Objective was not provided Statement about Future Work somewhat followed the Results	Conclusions were supported by the Results but the relevance to the Hypothesis/Objective was unclear or incomplete Statement about Future Work logically followed the Results	Conclusions were strongly supported by the Results and the relevance to the Hypothesis/Objective Statement about Future Work logically followed the Results and included next steps

	SCORE (1 - 5)
BACKGROUND AND HYPOTHESIS OR OBJECTIVE	
METHODS (Study Participants, Research Design, Procedures)	
RESULTS	
CONCLUSIONS AND FUTURE WORK	
TOTAL POINTS (OUT OF POSSIBLE 20)	

QUALITY OF THE PRESENTATION

	1	2	3	4	5
COMPONENTS OF PRESENTATION	Not all of the expected components are presented and the layout is confusing to follow	Not all of the expected components are presented and the layout is untidy and confusing to follow	Most of the expected components are presented, but the layout is confusing	All expected components are presented, but layout is crowded or jumbled making it confusing to follow	All expected components are presented and are clearly laid out and easy to follow
FORMATTING	Text is hard to read, messy and illegible, or has spelling or typographical errors	Text is hard to read due to font size or color, or has spelling or typographical errors	Text is relatively clear and legible, but has spelling or typographical errors	Text is relatively clear, legible, and mostly free of spelling or typographical errors	Text is concise, legible, and free of spelling or typographical errors
PHOTOGRAPHS/ TABLES/GRAPHS	Photographs/tables/graphs are poorly done	Photographs/tables/graphs are not related to the text or are poorly labeled or do not improve understanding of the project	Photographs/tables/graphs are not related to the text, or labeled correctly or do not improve understanding of the project	Most photographs/tables/graphs are appropriate and labeled correctly, which improve understanding of the project	All photographs/tables/graphs are appropriate and labeled correctly, which improve understanding of the project and enhance the poster visual appeal
AUDIO PRESENTATION	Audio presentation is very confusing	Audio presentation is generally unclear	Audio presentation is somewhat unclear and has inconsistencies	Audio presentation is clear for the most part, but has a few inconsistencies	Audio presentation is logical and very clear
KNOWLEDGE OF INFORMATION	Student does not have grasp of information	Student shows little knowledge of information	Student shows adequate knowledge of information	Student shows above average knowledge of information	Student shows exceptional knowledge of information
QUESTION AND ANSWER	Cannot answer any questions about subject	Answers only rudimentary questions	Answers questions without details or elaboration that demonstrate greater depth of knowledge and/or subject	Answers questions with few details or elaboration that demonstrate greater depth of knowledge and/or subject	Answers questions with explanations and details or elaboration that demonstrate greater depth of knowledge and/or subject

	SCORE (1 - 5)
COMPONENTS OF PRESENTATION	
FORMATTING	
PHOTOGRAPHS/ TABLES/GRAPHS	
AUDIO PRESENTATION	
KNOWLEDGE OF INFORMATION	
QUESTION AND ANSWER	
TOTAL POINTS (OUT OF POSSIBLE 30)	

Biology Seminar Evaluation

Evaluator Name: _____

Date: _____

Presenter Name: _____

PRESENTATION EVALUATION TOTAL (OUT OF POSSIBLE 20)	
QUALITY OF THE PRESENTATION (OUT OF POSSIBLE 30)	
TOTAL POINTS (OUT OF POSSIBLE 50)	

COMMENTS/FEEDBACK: _____

Evaluation Form based on Senior Seminar in Biology Rubric for BIO 425 Morehouse College.