Research Methods in Biology (BIOL 3000, Sec. 1) Spring 2019

Monday, Wednesday 1:40–2:55 p.m., Seq. 155

Instructor: Dr. David DesRochers Office: 224 Peeples Hall

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Office Hours: Monday & Tuesday: 11–12, Monday–Wednesday: 3–4, or by appointment

Textbook: A Short Guide to Writing About Biology (9th Ed.) (Pechenik)

Course Description: This course prepares students for independent research by training them how effectively to develop a research question and use the scientific method. Students will learn how to hypothesize, use experimental design, collect, manage, analyze, interpret and present data. A strong writing component will be required including development of critical scientific reading skills involving primary and secondary literature.

Student Learning Outcomes: Students will learn how to carry out the scientific method by the following ...

1. Identify, read, critique, and discuss different sources of published scientific literature.
2. Devise a scientific question/hypothesis and experiment/project.
3. Collect, manage, analyze, and interpret data and present that data in figures.
4. Communicate scientific information orally.
5. Write a research proposal.
6. Learn the importance of ethical conduct in research.

Course Policies

Grading: Your grade will be based upon the following ≈ 650 total possible points. Detailed descriptions of assignments are at the end of the course policy section.

In-class group discussions and summaries: 10 points each
Reference Assignment: 20 points
Mentorship Reflection: 10 points
Three reading assignments: 35 points each – 105 points
Research Proposal Components Drafts: 25 points each – 50 points
Peer Reviews of Proposal Drafts: 15 points each – 30 points.
Final Draft of Research Proposal: 100 points
Two Guest Reflections: 10 points each – 20 points
Data Analysis Assignments: 115 points
Peer Review of Oral Presentations: 25 points
Oral Presentations: 75 points

*Since this is the second time I have taught this course, I may make some adjustments to keep us all from going insane.

90–100% = A, 80–89% = B, 70–79% = C, 60–69% = D, Below 60 = F.

Extra Credit: I do make extra credit available throughout the semester, but since there are over 600 regular points to earn, anyone asking for extra credit, at any time, will activate a one-week period during which time no extra credit will be available.

Attendance: You are expected to be on time for all class periods. If you miss a class, YOU are responsible for finding out about missed assignments, announcements, and material covered. If you unexpectedly miss a day with group activities, please contact me as soon as possible, so we can work out a make-up solution. If you know you are going to miss a day due to a school-sponsored event, jury duty, etc., then you must schedule a make-up date with me prior to your absence.

Late assignments will lose 10% of the earned score daily up to three days late. They will not be accepted after that.

Academic Honesty: Cheating and plagiarism are a part of the Dalton State Code of Student Conduct, which can be found in its most updated form at http://daltoncampuslife.com/student-conduct/. ANY assistance provided or given in any way toward work in a class constitutes cheating, unless such behavior is authorized by your instructor. Additionally, any use of the ideas or words of others should be noted, or this will constitute plagiarism. For more details on what Dalton State considers to be Academic Dishonesty, please review the Code of Student Conduct. Instructors will assign grades
based on classroom performance. Additional sanctions may be provided as a learning experience from the Student Conduct process.

**Classroom Behavior:** Dalton State is committed to respect via the Roadrunner Respect pledge. To learn more, please visit [http://daltoncampuslife.com/roadrunner-respect/](http://daltoncampuslife.com/roadrunner-respect/). “I pledge to show my fellow Roadrunner students, faculty, staff, and administration respect by treating others the way they want to be treated and by thinking about others first before making decisions that might affect them.”

**Students with disabilities or special needs are encouraged to contact Disability Access.** In order to make an appointment or to obtain information on the process for qualifying for accommodations, the student should visit the Disability Access Library Guide at [http://libguides.daltonstate.edu/c.php?g=24716&p=149663](http://libguides.daltonstate.edu/c.php?g=24716&p=149663) or contact the Disability Access office. Contact information: Andrea Roberson, Associate Director of Disability Access and Student Support Services Pope Student Center, upper level, Dean of Students Office 706-272-2524, aroberson@daltonstate.edu

**Drop/Withdrawal Statement**

**Last day to drop without penalty: March 22, 2019.** You will be assigned a grade of **W**. After this date, withdrawal without penalty is permitted only in cases of extreme hardship as determined by the Vice President for Academic Affairs; otherwise a grade of **WF** will be issued. Students who wish to drop this class or withdraw from all classes should go to the Enrollment Services Office in Westcott Hall to complete the necessary form. Students who fail to complete the official drop/withdrawal procedure will receive the grade of **F**. **Withdrawal from class is a student responsibility.** Before dropping any class, the college **strongly advises** that students meet with their academic advisor and their instructor to discuss the impact of a withdrawal on their graduation plans. The college also **strongly advises** students who are receiving any type of financial aid to visit the Financial Aid Office to discuss the impact a withdrawal may have on their financial aid status. The grade of **W** counts as hours attempted for the purposes of financial aid.

**Cancelled class**

If classes are cancelled due to inclement weather, please complete the reading assignment for the date(s) that we miss class. Check your e-mail and GAView for additional instructions.

For information regarding HB 280 (campus carry) please visit the following website: [Campus Carry](http://www.campuscarry.com)
Title IX Information

Student Sexual Misconduct Policy
(Last Modified on August 9, 2017)

In accordance with Title IX of the Education Amendments of 1972 ("Title IX"), the University System of Georgia (USG) does not discriminate on the basis of sex in any of its education programs or activities or in employment. The USG is committed to ensuring a safe learning and working environment for all members of the USG community. To that end, this Policy prohibits sexual misconduct, as defined herein.

In order to reduce incidents of sexual misconduct, USG institutions are required to provide prevention tools and to conduct ongoing awareness and prevention programming and training for the campus community. Such programs will promote positive and healthy behaviors and educate the campus community on consent, sexual assault, alcohol use, dating violence, domestic violence, stalking, bystander intervention, and reporting.

When sexual misconduct does occur, all members of the USG community are strongly encouraged to report it promptly through the procedures outlined in this Policy. The purpose of this Policy is to ensure uniformity throughout the USG in reporting and addressing sexual misconduct.

How to Report
Please note that although you have the option to make a report anonymous, doing so may limit the College’s options for response. Call 911 if you are in an emergency situation

If you would like to report to a Police Agency:
Dalton State Public Safety
Health Professions Building- Upper Level
706-272-4461
Online Sexual Assault Report HERE

If you would like to report to Dalton State Administration:
DSC Online Reporting Form

Title IX Coordinator
Lori McCarty
Director of Human Resources
Phone: 706-272-2034
Email: lmccarty@daltonstate.edu

Deputy Title IX Coordinator
Assistant Director for Student Conduct
Phone: 706-272-2999

If you would like to talk with someone confidentially:
The Counseling Center
Health Professions 266 (Inside Health Center)
Phone: 706-272-4430
Assignment Descriptions

1. What is Science? Assignment (10 pts)
   a. This is an in-class, group assignment where, in groups of four, you will come up with a paragraph describing what science is. A class discussion will follow.

2. What is objectivity? Assignment (10 pts)
   a. This is an in-class, group assignment where, in groups of four, you will come up with a paragraph describing what objectivity is and how to achieve it. A class discussion will follow.

3. Reference Assignment (20 pts)
   a. Locate five scientific articles from 2017–2019 and cite them in proper scientific format. The articles can be (and probably should be) related to your area of interest and what you are thinking about for your research proposal. They must be on different information. As an additional source of help, check out the sample research proposals on GAView to see what a literature cited section should look like!
      i. You need to find and cite three primary literature articles. (3 pts)
      ii. You need to find and cite two secondary literature articles. (2 pts)
      iii. For each article list where you found it (for example, Google Scholar, Google, Science Citation Index, Galileo, etc.)
   iv. Citation format must follow as below
      1. Author list (last name, followed by first and last initial., next author, and so on). Year. The title of the article. Journal. Vol. #:page–range. (5 pts)
   3. All references must be in alphabetical order.
   4. I recommend looking at the Sample Research Proposals on GAView to see good examples of citations.
   v. One entry must be annotated. This means you write up a five sentence summary of the paper in your own words. This will help give you practice writing. In fact, each major section of a paper can be summarized in a single paragraph. Yes! It’s possible. (10 pts)

4. Mentorship reflection (10 pts)
   a. Write a reflection about what you learned during the peer research panel. Some questions to consider in your writing: What are your own interests in science (teaching, doing research yourself, neither) and why? What surprised about your peers’ responses to the questions and why? Did your thoughts about science and your college education change during and after the discussion? How so? How did your peers’ responses make you feel? What are your greatest hopes and fears for college and your profession?

5. Scientific Paper Reading Assignment 1 (35 pts)
   a. Write a ½ page summary of the article in your own words. You will be submitting this to GAView and it will run through Turn-it In. This website will analyze your writing to determine its uniqueness. If it is more than 20% similar to the article we are reading, then you will re-write it for half the possible points of the whole assignment. Everything should be rewritten in your own words. (5 pts)
   b. Write out the central question/hypothesis that the researchers tested. (5 pts)
   c. Write out five questions you have about the paper. Asking about a word’s definition is an unacceptable question because you can look up the meaning of the word. (5 pts)
   d. What is one thing you found difficult or challenging about reading the article? Why was it difficult? If nothing was difficult, then discuss why you found it not to be challenging. (5 pts)
   e. Now that the researchers have information, what is the next step? Discuss what can be done with the information beyond what the researchers suggest. Is there another biological system to which this information can be applied? (5 pts)
f. **Self- and peer-assessment.** You will be rating your own level of participation (out of 5 points) in the group discussion and then rating your peers (out of 5 points).

6. **Draft Hypothesis (5 pts)**
   a. Based on what we have so far discussed and what you have read, draft a hypothesis upon which you will develop your research proposal. You will submit this to GAView. Peers and I will provide feedback and you will revise the hypothesis.

7. **Proposal Hypothesis (10 pts)**
   a. You will submit a clearly revised hypothesis that is strong, clear, and concise.

8. **Methods Readings (35 pts)**
   a. You will be focusing on the methods of this paper. Do the methods make sense to you? Why or why not? If not, what could they have done differently? What would you add to the study? You must write this in paragraph form. You will be submitting this to GAView and it will run through Turn-it In. This website will analyze your writing to determine its uniqueness. If it is more than 15% similar to the article we are reading, then you will have to re-write it for half the possible points of the whole assignment. (5 pts)
   b. In your own words write out the central question/hypothesis that the researchers tested. (5 pts)
   c. Write out five questions you have about the paper. Asking about a word’s definition is an unacceptable question because you can look up the meaning of the word. (5 pts)
   d. What is one thing you found difficult or challenging about reading the article? Why was it difficult? If nothing was difficult, then discuss why you found it not to be challenging. (5 pts)
   e. Now that the researchers have information, what is the next step? Discuss what can be done with the information beyond what the researchers suggest. Is there another biological system to which this information can be applied? (5 pts)
   f. **Self- and peer-assessment.** You will be rating your own level of participation (out of 5 points) in the group discussion and then rating your peers (out of 5 points).

9. **Proposal Background Draft (30 pts)**
   a. Rubric-based assessment
   b. The background should be a big-picture assessment of the topic that you have selected to study. The background includes relevant information that ultimately leads to justifying why you are proposing to conduct your research. Recall that you will not be doing the research – merely proposing that it be done. The conclusion of the background section must include the specific hypothesis/question you are addressing. Some researchers list Specific Aims at the end of their background sections when they are writing proposals. You may wish to do this. You also will have the rubric to work with ahead of time. This is will help you craft your background section.

10. **Peer Review of Background Draft (15 pts)**
    a. You will turn in your reviews of your peers’ drafts. This can be in summary form with some detailed commentary. In your reviews you must comments on both strengths and weakness of your peers’ drafts. What did they do well? What need improvement. Thoughtful commentary that is free of grammar issues will earn top scores. If you provide a cursory review with little insight, then you will lose points.

11. **Guest Reflection (10 pts)**
    a. This is a half- to one-page write up of what you learned during the guest lecture. What surprised you about the visiting scholar’s discussion or message? How has it influenced your thinking about how science is conducted? How has the scholar influenced how you are thinking about your own career path?

12. **Data Sheet for plant biodiversity assessment (30 pts)**
    a. Rubric-based assessment
    b. In groups you will be designing data sheets for data collection that we will be doing during a subsequent class to describe biodiversity of plants in the forested areas along campus trails. You also will have the rubric to work with ahead of time.
13. Figure & Caption from plant biodiversity assessment (30 pts)
   a. Rubric-based assessment
   b. In groups you will be summarizing your data and displaying it in a figure with a caption. You also will have the rubric to work with ahead of time.

14. Meta-Analysis Reading Assignment (35 pts)
   a. Instead of summarizing the article you will be writing about whether you think the review was sufficient enough to answer the question. Why or why not? What would you have done differently to address the question? You will be submitting this to GAView and it will run through Turn-it In. This website will analyze your writing to determine its uniqueness. If it is more than 10% similar to the article we are reading, then you will have re-write it for half the possible points of the whole assignment.
   b. Write out the central question/hypothesis that the researchers tested.
   c. Write out five questions you have about the paper. Asking about a word’s definition is an unacceptable question because you can look up the meaning of the word.
   d. What is one thing you found difficult or challenging about reading the article? Why was it difficult? If nothing was difficult, then discuss why you found it not to be challenging.
   e. Now that the researchers have information, what is the next step? Discuss what can be done with the information beyond what the researchers suggest. Is there another biological system to which this information can be applied?
   f. Self- and peer-assessment. You will be rating your own level of participation (out of 5 points) in the group discussion and then rating your peers (out of 5 points).

15. Methods & Figure due for Database Analysis (50 pts)
   a. Rubric-based assessment
   b. You will be assigned a group and a database based on your personal scientific interests. In your groups you will analyze data from the database and write up methods on how you analyzed the data. You also will develop a figure based on your analysis. The rubric for the figure will be the same as before.

16. Proposal Methods & Significance of Results draft due (30 pts)
   a. Rubric-based assessment
   b. Your proposal methods should be a clear description of how you will test your hypothesis or answer your research question. Your methods likely will be similar to techniques used by other researchers. You must cite those methods. Your methods also must be repeatable. Can a reader follow your technique and repeat your study later on? If not, then you must revise your writing so it is clear. Your methods cannot be in a series of steps – listed out as 1, 2, 3, and so on. This section also must be written in paragraph form. Finally, what results do you expect to get? What will be the significance of those results? How will you use the information?

17. Peer Review of Methods Draft (15 pts)
   a. You will turn in your reviews of your peers’ drafts. This can be in summary form with some detailed commentary. In your reviews you must comments on both strengths and weakness of your peers’ drafts. What did they do well? What need improvement. Thoughtful commentary that is free of grammar issues will earn top scores. If you provide a cursory review with little insight, then you will lose points.

18. Guest Reflection (10 pts)
   a. See above description

19. Peer Reviews of presentation (25 pts)
   a. Each student does three and the average contributes to a presenter’s overall grade. The average score will make up 20% of the presenters’ grade.

20. Oral presentations (50 pts)
   a. Rubric-based assessment
   b. 5 minute presentations in which you present your proposed research. You must clearly state the hypothesis you propose to test and why you are testing it. What methods do you propose to use and why? What do you expect the significance of your results to be?
21. Final Research proposals (100 pts)
   a. Rubric-based assessment
   b. Your final proposal will be a major revision of your previous drafts. Starting early on all of them is the key to success here.
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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings/Assignments</th>
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<tbody>
<tr>
<td>Jan. 7</td>
<td>Course Intro, The Nature of Science</td>
<td>What is science? Assignment</td>
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<tr>
<td>Jan. 9</td>
<td>Objectivity vs. Bias, Passion, Ethics vs. legality</td>
<td>What is objectivity? Assignment</td>
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<td>Jan. 14</td>
<td>Student Mentors</td>
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<td>Jan. 16</td>
<td>How to find scientific information</td>
<td>Pechenik – Ch. 2, 3, 5</td>
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<td>Jan. 21</td>
<td>Library field trip!</td>
<td>Mentorship Reflection due 20th @ midnight</td>
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<td>Jan. 23</td>
<td>Reading &amp; Communicating Scientific Information (Paper breakdown)</td>
<td>Pechenik – Ch. 7</td>
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<td>Jan. 28</td>
<td>Grammar &amp; Writing; How to interact with people professionally</td>
<td>Reference Assignment due</td>
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<td>Jan. 30</td>
<td>Discussion Day</td>
<td>Reading Assignment 1 due (Gregoir et al.)</td>
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<td>Feb. 4</td>
<td>Observation &amp; Hypothesis development; Background discussion</td>
<td>Heath – Ch. 1 (What biologists do), Heath Ch. 2 (pg. 23–27), Pechenik – Ch. 10</td>
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<td>Feb. 6</td>
<td>Peer Review of hypotheses</td>
<td>Draft hypothesis due</td>
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<td>Feb. 11</td>
<td>Experimental Design (Manipulation vs. Observation)</td>
<td>Heath – Ch. 1 (pg. 6–21), Heath – Ch. 2 (pg. 24–28), Proposal Hypothesis due</td>
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<td>Feb. 13</td>
<td>Discussion Day</td>
<td>Methods Reading due (Crowell et al.)</td>
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<td>Feb. 18</td>
<td>Experimental Design (Replicates &amp; Sample size, Controls, Standardization, reducing variability)</td>
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<td>Feb. 20</td>
<td>Guest lecture</td>
<td>Background due to reading partner, Guest reflection due 24th @ midnight</td>
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<td>Feb. 25</td>
<td>Peer Review of Backgrounds</td>
<td>Pechenik – Ch. 6, Peer Reviews due</td>
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<tr>
<td>Feb. 27</td>
<td>What are data? Yes, data are plural!</td>
<td>Proposal Background draft due Mar 1 @ 5 p.m.</td>
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<td>Mar. 4</td>
<td>Data collection – Sampling Design</td>
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<tr>
<td>Mar. 6</td>
<td>Data collection – Field work I</td>
<td>Data Sheet due</td>
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<td><strong>Mar. 11, 13 – Spring Break</strong></td>
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<td>Mar. 18</td>
<td>Data collection – Field work II</td>
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<td>Mar. 20</td>
<td>Statistics</td>
<td>Pechenik – Ch. 4</td>
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<td>Mar. 25</td>
<td>Data Management, Analysis &amp; Figure Development – Computer Lab</td>
<td>Figure &amp; Caption due Fri @ 5 p.m.</td>
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<td>Mar. 27</td>
<td>Data Assignment</td>
<td>Pechenik – Ch. 9 (pg. 152 – 158), Proposal Methods draft due to reading partner</td>
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<td>Apr. 1</td>
<td>Peer Review of Methods</td>
<td>Peer Reviews due</td>
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<td>Apr. 3</td>
<td>Data Analysis – Computer Lab</td>
<td>Proposal Methods draft due 5th @ midnight</td>
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<td>Apr. 8</td>
<td>Figure Development – Computer Lab</td>
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<td>Apr. 10</td>
<td>Peer Review of Methods &amp; Figures</td>
<td>Methods &amp; Figure due Apr 13 @ 5 p.m.</td>
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<td>Apr. 15</td>
<td>Discussion Day</td>
<td>Meta-analysis reading assignment due</td>
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<td>Apr. 17</td>
<td>Guest Lecture</td>
<td>Guest Reflection due 19th @ 5 p.m.</td>
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<td>Apr. 22</td>
<td>So now how do you communicate with people professionally? Work day</td>
<td>Pechenik – Ch. 11 (pg. 223–227, 232), Proposal Final Draft due 21st @ midnight</td>
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<td>Apr. 24</td>
<td>Work day</td>
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<td>Apr. 29</td>
<td>Presentations – Day 1 (half of class)</td>
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<td>May 1 (2:45–4:45)</td>
<td>Presentations – Day 2 (half of class)</td>
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**Last day to drop without penalty: March 22, 2019**