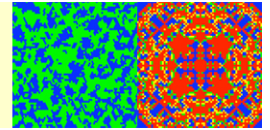


THE EVOLUTION OF COOPERATION



Research Project Guidelines

Project objectives:

1. Research scientific work that has explored biological cooperation:
 - ☐ Using library and internet research, obtain at least TEN (10) related sources of scientific information on how cooperation evolves. Discuss the methods and findings of these studies;
 - ☐ Use figures, graphs, or tables from your sources in an *Appendix* (see below). Make sure to properly cite the source of all components of the *Appendix*;
 - ☐ Based on this research, identify some important questions about cooperation; and
 - ☐ Choose a question that you can attempt to answer through your own observational study.
2. Design and implement a study testing one or more hypotheses about cooperation:
 - ☐ Consider all possible hypotheses that could potentially provide an answer to your question;
 - ☐ Use these hypotheses to generate testable predictions;
 - ☐ Design an experiment (manipulative or observational) that tests these predictions; and
 - ☐ Perform your experiment and gather data.
3. Analyze your data and reach a conclusion based on your study:
 - ☐ Display your data using clear tables, figures, and graphs (place these in your *Appendix*);
 - ☐ Discuss the meaning of your data, and contrast your findings with the predictions of your various hypotheses;
 - ☐ Relate your findings to the findings of the scientific studies you researched (see objective #1);
 - ☐ Reach a conclusion about what your findings mean, discussing their broader importance; and
 - ☐ Suggest ways in which your work could be extended to generate additional understanding(s).
4. Present your research project in oral and written form.

Some examples of the kinds of projects which could fulfill these objectives:

- ★ **Observational studies of animals:** We are lucky to have several high-quality zoos and aquaria in the New York City area, and many of these house animals whose social behavior can be directly observed by the public.
- ★ **Observational studies of humans:** We also are lucky to live in one of the most densely-populated cities in the world, and there are many opportunities to observe altruistic and/or selfish behavior in public spaces.
- ★ **Interviews with specific groups of humans:** Humans form groups based on various affiliations, including religions, professions, and hobbies. First-person interviews with members of one or more social groups have the potential to reveal the nature of cooperation and altruism present in these groups.
- ★ **Direct experiments with humans:** There are plenty of students on campus. Using a game theory exercise, interactive work, or some other humane experiment, you can gather direct data about cooperative behavior.

This list represents a beginning; it in no way represents the full extent of possible successful projects.

Summary of assignments and due dates:

Assignment to be completed	Date Due (at 11:59 pm EST unless otherwise noted)	Points	% of Total
Research Project Proposal	Friday, February 17th, 2012	5	2.5%
Draft Research Project Plan	Friday, February 24th, 2012	5	2.5%
<i>Peer Review</i> on Draft Research Project Plan	Wednesday, February 29th, 2012	5	2.5%
Revised Research Project Plan	Friday, March 2nd, 2012	10	5.0%
Organized Raw Research Data	Monday, April 2nd, 2012	5	2.5%
Draft Analyzed Research Data	Friday, April 6th, 2012	5	2.5%
<i>Peer Review</i> on Draft Analyzed Research Data	Monday, April 9th, 2012	5	2.5%
Revised Analyzed Research Data	Friday, April 13th, 2012	10	5.0%
Draft Final Research Project Write-Up	Wednesday, April 18th, 2012	15	7.5%
Research Project Abstract	Wednesday, April 18th, 2012	5	2.5%
<i>Peer Review</i> on Draft Final Research Project Write-Up	Monday, April 23rd, 2012	10	5.0%
Final Research Project Presentation	Wednesday, April 25th, 2012 (in class)	20	10.0%
Final Research Project Write-Up	Friday, April 27th, 2012	100	50.0%
TOTAL		200	100.0%

Proposals:

In order to get your project started on solid footing, you are required to submit a short project proposal. Your instructor will post comments on the *LMS* letting you know whether the project proposal is approved; if the proposal is not approved, you should contact your instructor during office hours, by phone, or via email.

Draft Work:

Throughout the semester you will be asked to submit “draft” work for review by your instructor and your *Peer Review Group* (see below). Although it is expected that “revised” work will be superior to “draft” work, the term “draft” should not be construed to mean hastily-conceived, incomplete, or poorly-composed. Those students who present the best possible “draft” work will get the most out of the review and revision process.

Peer Review Groups:

During Week 06 of class you will be assigned to a “Peer Review Group” of 3-4 students. Groups will be formed based on the project proposals made during Week 05, and will meet periodically during class to discuss their progress on the *Research Project*. Throughout the remainder of the semester,

you will be asked to provide formal peer review to your fellow group members based on their *Research Project* work. In turn, your fellow group members will reciprocate by providing you with formal peer review. Pay heed to your review group: your revised work is expected to address and/or incorporate the comments and suggestions made by your peer reviewers. You will be graded on both the quality of peer review you provide and how well you respond to valuable feedback from your reviewers.

Research Project Plans:

You are required to submit a *Draft Research Project Plan*. Members of your *Peer Review Group* as well as your instructor will give you feedback on your experimental design. Based on these comments and suggestions, you will compose and re-submit a *Revised Research Project Plan*.

The *Research Project Plan* should be composed of five sections:

- The **Background** section is where you should summarize the findings of your sources. What has been discovered about the cooperative behaviors you are interested in? What methods have been used to make these findings? What questions about the nature of this cooperative behavior still need to be answered?
- The **Research Question** section will contain a single sentence that states the question your study will answer. This *Research Question* should be detailed enough to give your audience a clear idea of what you are investigating, but concise enough to be a single sentence. For example, I might ask "Are Pratt students more likely to hold the door for each other in the morning, afternoon, or evening?"
- The **Hypothesis & Predictions** section will be composed of all possible hypotheses that might answer your chosen question. For each of these hypotheses, write predictions in the "If... then..." format. For example, for the question above I might hypothesize that Pratt students are most likely to hold the door for each other during the evening, when concerns over getting to class are lessened. My stated prediction for this hypothesis would be "IF Pratt students are more likely to hold the door for each other in the evening, THEN I should observe more students taking the opportunity to hold the door for others during the evening as compared to the morning or afternoon".
- The **Materials & Methods** section will contain detailed instructions on how you will perform the experiment that tests the predictions you made in the **Hypothesis & Predictions** section. The standard of quality for this section is simple: anyone with basic scientific knowledge should be able to perform the experiment using the instructions found in the **Materials & Methods** section. If you want, you can write this section in the past tense (as if you already performed it); this will make composing your *Research Project Write-Up* easier.
- The **Sources** section should list all sources discussed in your **Background** using a standard, consistent bibliographic format. Please number your sources: this allows you to easily cite each source in your **Background**.

Research Data:

You will collect data based on your research plan during Weeks 08, 09, and 10 (you also have Spring Break during this interval, so you have nearly a month over which you can collect data). You are required to submit your *Organized Raw Research Data*, which we will work to analyze and transform into useful figures, tables, and graphs. You are required to submit *Draft Analyzed Research Data*, which will be reviewed by your *Peer Review Group*. Based on this feedback and the feedback you receive from your instructor, you will submit *Revised Analyzed Research Data*.

Elements of the *Analyzed Research Data*:

- Your analysis should have two fundamental sections: the **Results** and the **Appendix**.

- The **Results** section will be a simple, clear description of your experimental findings. These findings should be related to the **Materials & Methods** section in that they explain what happened when you completed your *Research Plan*. Rather than including lists of raw data, the **Results** section should refer to the figures, graphs, and tables found in the **Appendix** section, pointing out any important trends in the data generated by your experiment.
- The **Appendix** section should contain all of the figures, graphs, and tables you created to display your data.

Final Research Project Write-Up:

You are required to submit a *Draft Final Research Project Write-Up*. Members of your *Peer Review Group* as well as your instructor will give you feedback on this write-up. Based on these comments and suggestions, you will compose and re-submit a *Revised Final Research Project Write-Up*.

Your *Final Research Project Write-Up* should have seven (7) fundamental sections: a **Title**, an **Introduction**, the **Materials & Methods**, the **Results**, a **Discussion**, the **Literature Cited**, and an **Appendix**:

- For the **Title** you may use either a descriptive phrase or the **Question** that you submitted as part of your Research Plan. If your **Question** is not used, make sure that the **Introduction** clearly explains what question you are answering in your study.
- The **Introduction** should include an overview of other research that has been done to answer questions related to your own. To meet the minimum requirements, you must cite at least ten (10) sources that describe previous research completed in this area. In addition to describing what was known prior to your study, the **Introduction** should explain the significance of your question. The **Introduction** should also provide critical background information that allows the reader to understand the question you are asking. Finally, the **Introduction** should explain the hypotheses you plan to test, along with the predictions you will use to test these hypotheses.
- The **Materials & Methods** section provides a succinct summary of what you did (your experiment). If you did a good job on your research plan, you should be able to cut-and-paste this directly from previously submitted work.
- The **Results** section should describe your data using reference to figures, graphs, and tables listed in your **Appendix**. If you did a good job in analyzing your data, you should be able to cut-and-paste this directly from previously submitted work.
- The **Discussion** section should interpret the **Results**, pointing out the significance and broader importance of what you discovered. It suggests reasonable interpretations of your data, and draws conclusions from your work. It also should suggest directions for future work that is inspired by the work already completed.
- The **Literature Cited** should provide a numbered list of all sources used to compose your paper. Do not include sources that have not been cited in the main sections of your paper.
- The **Appendix** should contain all of your graphs, figures, and tables, each labeled *and* titled so that they can be easily and unambiguously referred to in the main text.

You may also want to include an **Acknowledgements** section that thanks people who helped you to complete your project.

Format of the Final Research Project Write-Up:

1. Please present your work in type-written, **single-spaced** format. The font should be 12 point, margins should be 1" on all sides.
2. Produce at least three (3) and no more than six (6) pages of **single-spaced** text.
3. The main sections of the *Write-Up* should create a formal narrative. Please present coherent paragraphs that flow logically. Do not present lists or outlines.

4. Provide an *Appendix* (does not count towards page minimum or maximum) that presents figures, tables, lists, charts, images, or other helpful auxiliary information to support your paper. Label each part of your *Appendix* with a letter (for example, the first item will be “Appendix A”). Make sure that you refer to all parts of the *Appendix* in the main text of your paper.
5. Reference all ideas that are not your own using a numbered *Bibliography* (does not count towards page minimum or maximum) appearing at the end of your paper. Both superscripts¹ and bracketed [2] citations are acceptable, but use a consistent format.

Citations:

1. All citations must be referenced in the text. In referencing your citations, use the correct number from your numbered *Literature Cited*. For example: “Methane released by livestock represents a major contribution to greenhouse gas emissions [6].”
2. Please use a standard bibliographical format and use it consistently.
3. Please be careful about web citations. Much of what is published on the web is unreliable. It is up to you to assess the validity of all your sources.
4. Internet references should be cited with a page title, a full URL address, and the date accessed. For example: Ecology for Architects Main Page, <http://sci177a.pratt.edu/index.html>, Accessed 5-Feb-2012.

Research Project Abstracts for in-class project presentation:

Prior to presenting the results of your *Research Project* in class, you will provide your classmates with a *Research Project Abstract*. Your abstract will allow fellow students to learn about your project before coming to class, and should be composed of a single paragraph of less than 150 words. Your instructor will be posting all student abstracts on the *LMS*; these summaries are the reading assignment for Week 14.

Final Research Project Presentation:

During Week 14, each student will present the results of her *Research Project* to the class. To assure that all students have the opportunity to present, each student will be allotted ten minutes. How you use that ten minutes is in part up to you, but you are encouraged to leave some time for questions and/or comments from your classmates. You are highly encouraged to take advantage of the multimedia capabilities of our classroom: presentation slides or other visual media will make it much easier to explain your project and its findings in the limited time frame provided. You may upload presentation materials directly to the *LMS* prior to Week 14’s class, and your instructor will assure that these presentation materials are loaded and ready to use when it is your turn to present.

Submission of Research Project work:

Unless otherwise specified, all submission of work should be done via the *Learning Management System (LMS)* in *Adobe PDF* format. There is a 10% penalty per day of lateness for all assignments.

How you will be graded:

Your grade will be primarily based on how well you meet the objectives stated above. In addition, your instructor will assess how well you expressed an understanding of evolutionary concepts. All written work is expected to use proper spelling and grammar, except where obvious and necessary creative liberties are being taken with the language. Please see the *LMS* for sample grading sheets that provide you with a precise idea of how you will be graded.

On academic honesty:

Plagiarism of any kind will not be tolerated. All cases of suspected plagiarism will be turned over to the Registrar’s office for potential referral to the academic judiciary. Please be careful to indicate the source of all ideas other than your own; this includes both direct quotes (“evolution is the science of...”) and paraphrasing of books, scientific papers, and websites. Careful citation makes you seem more authoritative in whatever you write.