

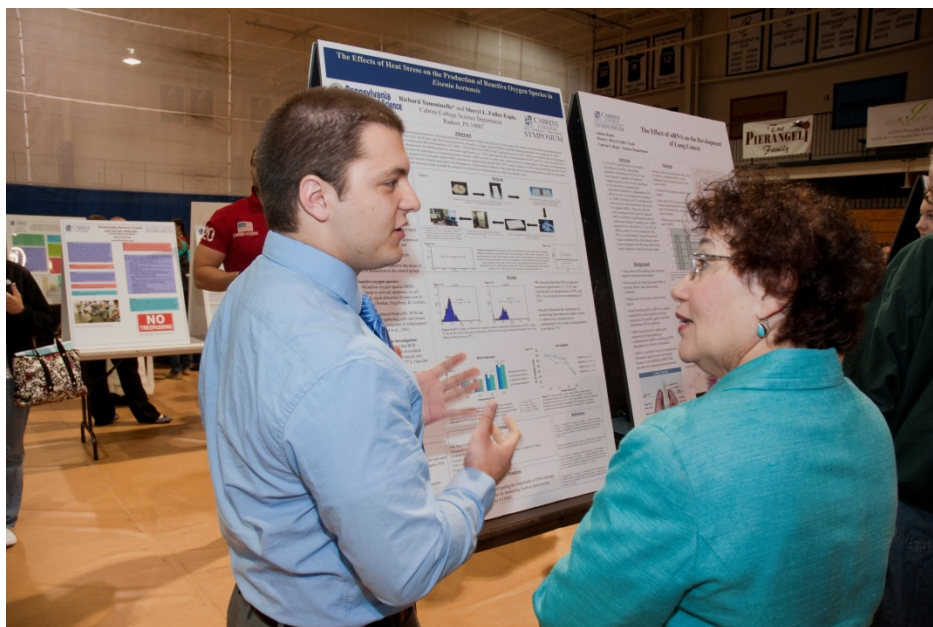


CABRINI COLLEGE

Capstone for the Sciences

2014–15

BIO 444 / CHE 444: Senior Seminar



Science Department

Iadarola Center for Science, Education, and Technology

www.cabrini.edu/Science

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Preparing for Senior Seminar in Your Junior Year

As you near the completion of your junior year in our Science Department program, whether you are a Biology or Chemistry major, you need to begin planning for your final year at Cabrini College, your capstone project, and the activities that will play a role in your transition from your undergraduate experience to your post-graduate career or professional studies.

The capstone course for all of the science majors' programs is Senior Seminar (BIO 444/ CHE 444), which meets during the fall and spring semesters of your senior year. All science majors attend the same course. Senior Seminar aims to meet several important objectives:

1. Providing a culminating experience that integrates the undergraduate academic program with career endeavors
2. Encouraging students to take advantage of available services and strategies for career planning and post-baccalaureate educational opportunities
3. Encouraging students to use their knowledge of science to explore and develop a topic of their own choice in some depth
 - Where possible, this will involve an independent undergraduate research project where students work under the supervision of a faculty member at Cabrini College or at an off-campus site.
4. Providing students with opportunities for written, spoken, and graphic presentations of research materials
5. Encouraging collegial interactions among students and faculty through honors conference participation, poster presentation and oral defense
6. Participating in a peer-review process to facilitate constructive feedback from peers with the aim of providing articulation and clarity to the senior thesis

In previous courses that you have taken, the subject matter was chosen by the instructor, and it was your job to master it, with or without the cooperation of fellow students.

In this course, *you* will choose the subject matter, *you* will develop knowledge and understanding of the subject and *you* will share your knowledge and problems with your peers.

Students must recognize that they have a stake in the success of others and that others help them to succeed.

The course instructors (Mentors) will serve as a guide, a resource, and if necessary, a trouble shooter. The Mentors will also assist students with reading the literature and understanding the scientific methodology employed to support research claims made in journal articles.

In the beginning, you will undoubtedly feel as if the Senior Thesis is an impossible and intimidating task, and that you will never be able to get it done. By the time you are finished, you will realize that you have become an expert in something and that you can represent it in any of a variety of forms.

The sense of accomplishment and confidence comes from knowing that it is an important contribution to science and that *you did something extraordinary!* The sharing of the experience becomes the bond with classmates and faculty mentors.

General Overview of Senior Seminar Activities

During the fall semester, the seminar will focus on the selection and development of thesis topics. The initial class meetings will deal with choice of thesis topics and how to search the literature for information concerning your topic.

Early in the semester, each student will be paired with a Science Faculty Mentor, if one has not already been determined based on course section assignment. The Mentor will serve as a resource and advisor during the thesis and poster preparation over the course of the academic year. The remainder of the semester will be devoted to the development of the thesis topic and oral presentations of progress reports.

The second semester activities will focus on completion of the written thesis and preparation for the Cabrini College Annual Undergraduate Arts, Research and Scholarship Symposium (which will include a poster presentation), and the oral defense. The first draft of the thesis will be reviewed by a peer–editor. You will have an opportunity to make changes based on your peer–editor’s recommendations. The final draft will be evaluated by the faculty mentor for grading purposes. The final draft of the thesis will be due in March.

What You Need to Do the Summer before Your Senior Year

Probably the most important thing that needs to be done is to think about the areas of your discipline which interest you. This will lead you to topics which could be the basis of your thesis work. You need to begin reading and reviewing of some of your science coursework and identify a topic that you will develop for your Senior Thesis.

In mid–September, soon after you return from your summer break, you will submit three annotated references from primary peer–reviewed sources that are tied to your chosen topic, so you need to begin reading the literature and acquiring articles for this purpose.

In general, the Senior Thesis may take one of two forms: a library investigation project (**literary review**) or a **laboratory–based project** (original research). If you choose the **literary review**, it would be very beneficial to begin as soon as possible to determine your topic. This can be done by reviewing your previous course work, particularly those areas which interested you most. Also, talk to faculty members in the Science Department to explore possible areas which you might have overlooked but are possibly of interest and importance to you.

If you would like to become involved in a **laboratory–based investigation**, it is important that you begin to make plans with a faculty member this spring or during the summer at the latest. This will allow you to plan your project in a timely fashion so that the actual research can be accomplished in the most efficient manner.

Members of the Science Faculty may serve as research advisors or will describe the various types of research opportunities available through internships off–campus. If you are not clear how to begin finding a research opportunity, contact your academic advisor to obtain more information. If you have plans to work in an off–campus setting, it is important to make arrangements this spring with the instructors of Senior Seminar.

Please note that students may reference work already submitted for BIO/CHE 488 or RBIO/RCHE 444 in the “Background” of their Senior Thesis, but the “Current Investigation” section is expected to be original and never submitted previously for evaluation in the Science Department.

Senior Thesis Topics

Senior Thesis topics may be experimental or may be based on a study of the published literature on your chosen subject. In either case, the topic of the thesis must be relevant to your major and there must be a significant body of published literature on the topic. You should look at senior theses available to students in the Iadarola Center, Room 212, which were completed by past students, to give you an idea of what will be expected and the types of topics that are appropriate for a senior thesis.

You should start by doing some general background reading about your topic. You would begin by looking at the **chapters in your textbooks** in courses that you have taken at Cabrini College that are related to your topic.

Are there any references at the ends of the chapters that direct you to more in-depth texts or **scientific journal articles** published on your topic? If so, look them up. If there are no such references, your next step would be to look for a more advanced texts and articles using the library Cavalog and databases.

Use **interlibrary loan** to order materials that are not available through the Holy Spirit Library. **Review articles** are a perfect place to begin! These articles will provide a summary of the general state of knowledge on your topic (at the time the review was written) and also provide ample references to relevant primary peer-reviewed articles that you will need for your research.

You might want to visit larger libraries at other colleges and universities to access journals and reference books that the Holy Spirit Library does not hold. You will be able to photocopy material at most libraries. Be sure that you note the complete reference for the source in APA format, and that you copy the entire bibliography at the end of the article because you may need to refer to the reference list at a later date.

Science Department faculty members are available to you for discussion as you begin to choose your thesis topic, and you can also consult professionals outside of the department. You should try to arrange a meeting with a faculty member(s) during the end of your junior year because your first assignment will be due in early September, shortly after you return from summer vacation.

You may also know someone who is involved in research or someone may refer you to such a person. These people can be invaluable in helping you to identify topics and to determine whether they are appropriate for a senior thesis.

Final approval of topics rests with the instructor of the course. Advice on how to use Medline, Internet sources, databases, other libraries, will be covered in further class discussions early in the fall semester, but you can obtain assistance with advanced searches at any time by contacting the staff at the Holy Spirit Library.

Annotated References Assignments

You will read each primary peer-reviewed journal article (not review articles) and then in your own words summarize the objectives and results of each article. Each annotated reference should be **at least** 1/3 page in length (17 lines, single-spaced, 12-point font, one-inch margins, Times New Roman font).

- **Do not** copy word-for-word from the abstract of the paper. You must submit a photocopy of the abstract (not full article) for each source you annotate.

When you submit your annotated bibliographies, each bibliography must provide four things.

First, you must write a summary as described above.

Second, you must provide a citation written as it will appear in your reference list/bibliography in your Background/Final Thesis using APA format.

Third, you must also demonstrate how such an article will be cited within your narrative (in-text citation) the first and subsequent times you cite the source. Pay particular attention to APA guidelines regarding multiple authors!

Finally, you must demonstrate critical analysis skills by including two to three sentences that address the strengths and weaknesses in addition to the applicability/validity of each article.

Please refer to the following websites when preparing your annotated references for suggestions and specific examples using APA format:

<http://olinuris.library.cornell.edu/ref/research/skill28.htm>

<http://library.concordia.ca/help/howto/annotatedbibliog.php> (see examples according to APA)

<http://owl.english.purdue.edu/owl/resource/614/01/>

Progress Report I – Fall Semester (150 Points*)

Progress reports on thesis topics will be presented orally before the class during the last three weeks of fall semester. Each report will take approximately 15 minutes with 3–5 minutes for questions and discussion.

Students will be assigned a date to present their progress reports (refer to course syllabus) and these dates will be determined by lottery. You may switch dates with another student, however, the course instructors must be informed of the switch at least one week ahead of time and ***absolutely no exceptions will be permitted.***

You will present your material in Power Point format. The main focus of Progress Report I will be on the ***background*** section of your thesis. The BACKGROUND section should focus on past research related to your topic that has set the stage for the “Current investigations” section of the thesis.

*Please note that the CURRENT INVESTIGATIONS section of your thesis should date back no more than two to three years and that you will present information on your current investigations in Progress Report II in the spring.

Instructions for Presentations

An outline will be distributed at the beginning of your presentation. This should be typed and photocopied for each class member. The outline for your talk and your power point presentation should follow the format below:

Introduction

- a. What is the general context of your topic? Is it immunology, microbiology, physiology, combinatorial chemistry, cell biology, genetics, drug interactions, evolution, ecology, behavior, etc.?
- b. What specific aspect are you examining?
- c. Why did you find this topic interesting? Why is this topic important?

Review some general background that your audience should be familiar with from course work. If for example, your topic deals with an autoimmune disease, you should review what autoimmune diseases are, how they are triggered in the body, which tissue or cells are involved, what role does the immune response play, and how is the disease treated.

The goal of the **Introduction** section is to introduce enough foundation material to the class so that general terminology and basic background information is provided for the remainder of your presentation. Limit your **Introduction** to only what is necessary to understand the rest of your talk and don't try to review absolutely every aspect of your topic.

Focus of Your Research

- a. What particular aspect of this topic did you research?
In the example above for instance, were you interested in the environmental trigger for autoimmune disease, HLA disease associations, immunoregulation, chemotherapy, etc.?
- b. What kind of research is associated with this aspect of your topic?
You are charged with the difficult task of consolidating a large amount of material into something that the class can understand in approximately 15 minutes. Don't try to introduce every review article or journal paper that you have acquired and avoid getting bogged down with too much specific detail or you will lose your audience.

Remember, you will be discussing research tied to the **BACKGROUND** section of your thesis in this progress report. Provide a concluding transition remark during Progress Report I for the last section of your thesis (Current Investigation) which you will present in the spring during Progress Report II.

Methods

Describe the kinds of investigations that were conducted in the earlier studies, or that you carried out (if you are writing a research-based thesis), and describe the methods that were used. For example, if your topic was autoimmune disease, you might have read papers (or books) about molecular mimicry, superantigen triggers, T-cell immunoregulation, or oral tolerance. Communicate to the class what kinds of laboratory assays were used to obtain the results in the studies that you reviewed in your journal articles. What type of experimentation was involved? Briefly explain the standard protocols, the controls and how the data was obtained.

For the example provided, you might need to explain proliferation assays, ELISA, cytotoxicity assays, immunohistochemistry, or transgenic mouse production if these techniques were used in the papers you are using. *Students must include flow charts or appropriate diagrams to help explain the steps of the methodology associated with each experiment that they are describing.*

Results

What kind of information was gained from these early experiments? Introduce the results from specific papers that you will use in your **BACKGROUND** section and refer to the methods described in the previous section.

The focus will be on the data that have been accumulated to establish certain points that will be the foundation for the Current Investigations section of your thesis. Are different investigators finding different results or the same results? What were the controls? Did the results support the authors' hypotheses?

Discussion

Summarize the early studies of your research. Which points are open to controversy and why? Briefly review which papers you will be investigating for the **CURRENT INVESTIGATIONS** section of your thesis which will be presented in the spring. Progress Report I is intended to communicate where you are in preparing your senior thesis with a focus on the **BACKGROUND** section of your thesis which is due at the end of the fall semester.

Everyone at this stage should have read a considerable amount of material relating to their topic and should be aware of what still needs to be accomplished. Obviously there will be material that you have not read or acquired yet, and there is still time to integrate this into your thesis, so do not feel that the progress report is a reflection of the final product.

Instead, think of the progress report as part of the overall process and an early tool which will provide you with focus for the next stage of review and writing.

- Please note that 15 points of your Progress Report I are awarded based on your **participation** in your peers' Progress Reports. You are expected to be an active participant and to look interested, take notes and ask meaningful questions. Your participation will be noted during each presentation (see rubric below). Your peers have spent a lot of time preparing their presentations and they need your support!

Senior Seminar Progress Report Rubric

Attendance at Mentoring Sessions _____ out of **30 points**

Participation _____ out of **15 points** Distribution of Outline _____ out of **10 points**

	Exceeds Expectations	Meets Expectations	Needs Some Improvement to Meet Expectations	Needs Substantial Improvement to Meet Expectations
Oral communication skills (including clarity and professionalism) 15 points	Student demonstrates exemplary command of subject matter, engages audience, and narrative provides a seamless flow of information. 13–15	Student demonstrates familiarity with subject matter, engages audience, and provides logical narrative structure. 10–12	Student is lacking in either familiarity with subject matter, ability to engage audience, or logical narrative structure. 7–9	Student is lacking in two or more of the following: familiarity with subject matter, ability to engage audience, or logical narrative structure. 0–6
Appropriate visual aids (including organization and neatness) 15 points	Slides (or poster) have excellent visual appeal, highlight critical information, and provide strong support for the oral presentation. 13–15	Slides (or poster) are neat and attractive, well organized, and highlight critical information. 10–12	Slides (or poster) are lacking either visual appeal or clear information. 7–9	Slides (or poster) are lacking both visual appeal and clear information. 0–6
Presentation of relevant background information (and methods, as appropriate) 15 points	Student provides ample relevant and engaging foundational concepts to frame main topic, and summarizes this information clearly and concisely. 13–15	Student provides sufficient relevant foundational concepts to frame current studies, and summarizes this information clearly and concisely. 10–12	Student either fails to provide sufficient relevant foundational information, or fails to summarize clearly and concisely. 7–9	Student both fails to provide sufficient relevant foundational information, and fails to summarize clearly and concisely. 0–6
Presentation of main topic: information/data 15 points	Student comprehensively articulates the central ideas of the topic, with clear and compelling presentation of data. 13–15	Student accurately explains the central ideas of the topic, and clearly presents relevant data. 10–12	Student either fails to accurately explain the central ideas of the topic, or fails to clearly present relevant data. 7–9	Student both fails to accurately explain the central ideas of the topic, and fails to clearly present relevant data. 0–6

Ability to synthesize information and draw conclusions (with future directions, as appropriate) 15 points	Student demonstrates excellent critical and analytical skills in synthesizing a variety of information and highlighting its significance. 13–15	Student draws connections between separate pieces of information and highlights its significance. 10–12	Student either fails to draw connections between separate pieces of information or fails to highlight its significance. 7–9	Student both fails to draw connections between separate pieces of information and fails to highlight its significance. 0–6
Ability to answer questions clearly and accurately 20 points	Student demonstrates exemplary content knowledge, applies this information accurately and creatively, with poise and clarity. 17-20	Student demonstrates adequate content knowledge, applies this information accurately, and speaks clearly. 13-16	Student either fails to accurately apply content knowledge or fails to answer questions clearly and directly. 10-12	Student both fails to accurately apply content knowledge and fails to answer questions clearly and directly. 0-9

Notes:

TOTAL _____ out of **150 points**

Outlines for: 1) Background (100 points – Fall); and 2) Final Thesis (100 points – early Spring)

You will prepare an outline for the Background section and Full Thesis using a standard Roman-numeral format (see below). Refer to course syllabus for due date.

Roman-Numeral Format

I.

II.

A.

B.

1.

2.

a.

b.

Refer to the websites below for examples and suggestions of how to prepare your outlines.

Also, note that you must include in-text citations (APA format) embedded in your outline (in parentheses, following the relevant section) to demonstrate where in your background you plan to use each of your eight primary peer-reviewed journal articles.

- Note that for your Final Thesis Outline, you must **also** include a visual diagram, flow chart, or concept map that clearly illustrates the connectedness between all of the topics and journal articles that will be embedded in your final thesis.

<http://web.psych.washington.edu/writingcenter/writingguides/pdf/outline.pdf>

<http://www.lavc.edu/library/outline.htm>

Background Format Guidelines

The Background section of the senior thesis must follow the guidelines specified below. Adherence to these guidelines is an expectation and will be assessed using the Background Rubric.

- a. Backgrounds must have 1" margins, use 12-point Times New Roman font and be devoid of grammatical and spelling errors.
- b. The Background will be double-spaced and paragraphs will be indented.
- c. Do **not** insert extra spaces **between** paragraphs, a default feature of some word-processing programs. To avoid this from happening, press "Shift" and "Enter" to separate paragraphs and insert the appropriate spacing (double-spacing).
- d. In the Fall Semester the Background is expected to be a minimum of 12 full pages (note that in your final thesis, this section will be expanded in the Spring Semester, based on your mentor's comments, to 15 pages). Students will incur a penalty of 10 points per page that does not meet the expected page guideline. For example, if 11 pages are submitted instead of 12, then a 10-point penalty will be assigned to the final rubric (see next page).
- e. Use APA format for in-text citations and the reference list. A minimum of eight primary peer-reviewed journal articles must be cited and summarized within your Background and referenced in your reference list. Additional citations are encouraged.
- f. Figures and/or tables from primary sources must be included in an Appendix that will follow your Background. All figures or tables must:
 - 1) be numbered chronologically in the order they appear in your Background and be indicated in bold in the narrative
 - 2) have a title (in bold)
 - 3) include a legend (a brief description of what the data shows, being sure to identify such features as axes, units of measure, order of samples in lanes, controls, different symbols, etc.
 - 4) an in-text APA-format citation, placed at the end of the legend in parentheses, that references the source of your data

Background Rubric (250 Points) Subject to Change

Student demonstrates ability to:	(4) Exceeds Expectations	(3) Meets Expectations	(2) Needs Some Improvement to Meet Expectations	(1) Needs Substantial Improvement to Meet Expectations
Select appropriate articles. 30 Points	Student has selected sufficient articles, including a broad coverage of background information on the topic. 27–30	Student has selected sufficient articles, including substantial, but not exhaustive, background information. 24–26	Student has selected sufficient articles but lacks some critical background information. 16–20	Student has failed to find a sufficient number of articles and lacks necessary background information. 0–20
Summarize narrative content of articles. 50 Points	For each article, the main point(s) relevant to the background are presented clearly and with apparent accuracy. 45–50	For each article, the main point(s) relevant to the background are summarized adequately. 40–44	Most articles are summarized, but some relevant information from the selected articles is missing or unclear. 35–39	The relevant main point(s) of many articles are missing or unclear. 0–34
Summarize quantitative/ graphic content of articles. 50 Points	Relevant figure(s), table(s), and/or quantitative data are presented with clear and accurate explanations. 45–50	Relevant figure(s), table(s), and/or quantitative data are presented with some explanation. 40–44	Relevant figure(s), table(s), and/or quantitative data are presented, but some are not clearly or accurately explained. 35–39	No relevant figure(s), table(s), or quantitative data are presented, or many are presented with missing or inaccurate explanations. 0–34
Think critically about articles. 50 Points	Student points out strengths and weaknesses of many articles, and raises a significant number of questions about their validity and/or applications. 45–50	Student points out strengths and weaknesses of some articles, and raises a few questions about their validity and/or applications. 40–44	Student points out strengths and weaknesses of some articles, or raises a few questions about their validity and/or applications. 35–39	Student fails to point out strengths or weaknesses of any articles, or raise questions about their validity and/or applications. 0–34

<p>Make connections among articles.</p> <p>40 Points</p>	<p>Student presents clear, insightful connections among many of the articles, and structures the paper to highlight these connections.</p> <p>36–40</p>	<p>Student presents clear connections among several of the articles, and structures the paper to highlight these connections.</p> <p>32–35</p>	<p>Student presents some connections among articles, but structure does not highlight these connections.</p> <p>28–31</p>	<p>Student fails to make connections among more than a few articles.</p> <p>0–27</p>
<p>Present analysis clearly and use correct citation format according to APA guidelines for in-text citations and reference list.</p> <p>30 Points</p>	<p>Paper is written in a clear and engaging style, and follows conventions of good scientific writing and meets Background Format Guidelines (Capstone Manual) in nearly all instances. Resources are cited correctly in narrative and in the reference list.</p> <p>27–30</p>	<p>Paper is clear and has only a few errors of scientific writing convention and meets Background Format Guidelines in nearly all instances. No more than three resources are cited incorrectly in the narrative and/or the reference list.</p> <p>24–26</p>	<p>Paper is mostly clear and follows scientific writing conventions more often than not and meets Background Format Guidelines in most instances. More than three but less than ten resources are cited incorrectly in the narrative and/or the reference list.</p> <p>21–23</p>	<p>Paper is unclear and/or fails to follow conventions of scientific writing and/or does not meet Background Format Guidelines. Ten or more errors in citations in the narrative and/or the reference list are made.</p> <p>0–20</p>

Outline for Full Thesis – Due January (100 points)

In January, you will submit an outline of your entire thesis using the same Roman numeral outline format as you did for your Background. This will be based upon the 16 primary peer-reviewed articles which you have annotated.

Your **Background** section is already complete at this stage (including the outline) and you should have a very good idea of what your **Current Investigation/Critical Analysis*** or **Methods/Results/Discussion**** section will include.

In your outline break up the material into logical subheadings that tie together with logical transitions using the same format you used for the Background outline.

This outline will be the basis upon which you begin to write your **Current Investigation/Critical Analysis** or **Methods/Results/Discussion** section, which should commence beginning in December and following through March.

The outline is a guide, and your thesis may change, but it will require that you think about the research that you will include in your **Current Investigation/Critical Analysis** or **Methods/Results/Discussion** and how you will assimilate that information and methodology.

- Note: You must **also** include a visual diagram, flow chart, or concept map that clearly illustrates the connectedness between all of the topics and journal articles that will be embedded in your final thesis.

*For students conducting a literature review

**For students writing about their original research

Progress Report II – Spring Semester (150 points*)

The second round of progress reports take place in the spring semester. A power point presentation will update the class on the progress of your thesis.

Because you have already shared the general BACKGROUND with the group, you only need to briefly describe the BACKGROUND to refresh everyone's memory of your topic.

Please emphasize DATA in this progress report that is associated with your CURRENT INVESTIGATIONS. Be prepared to discuss experimental results and conclusions that you will be included in your final thesis.

- Students must include flow charts or appropriate diagrams to help explain the steps of the methodology associated with each experiment that they are describing.

Distribute a handout to the class with an outline of your talk and photocopies of any key tables/figures/charts that will facilitate comprehension of your information.

You may present material in this talk that you plan to present at the Cabrini College Arts, Research, and Scholarship Symposium or other conferences that you plan to attend before graduation.

All presentations will be 15 minutes each with three to five minutes for questions and discussion. You should preview your talk with a colleague ahead of time to ensure that you are able stay in the time limits. Students presenting for less than 15 minutes will be penalized.

* Please note that 25 points of your Progress Report II will be awarded based on your **participation** in your peers' Progress Reports.

- You are expected to be an active participant and to look interested, take notes, and ask meaningful questions at **every** presentation.
- Your participation will be noted **during each presentation**.
- Your peers have spent a lot of time preparing their presentations and they need your support!

See pages 9-10 for Rubric for Progress Report II.

Instructions and Format for Senior Thesis – Due March

Senior theses are divided into two categories: those based on original laboratory research conducted with a faculty member or internship supervisor; and those based upon an in depth literature review. Both types will follow the same general format, but there will be **some specific differences (see below*)**.

All theses are to be divided into sections as described below. Any differences in requirements between laboratory research and literature reviews will be noted in each section. All theses will be written in APA format. Refer to the Bedford Researcher for a detailed explanation of how to use APA format in your narrative and your reference list.

Title Page

The title of the thesis should be centered on the title page. In the lower right-hand corner, list your full name, the date of submission, your editor, and the name of your thesis advisor (Mentor).

Abstract

An abstract of the thesis, not to exceed one page, is **single-spaced**. The abstract is a summary of your investigation. It states what you were investigating and indicates the methods used to do the investigation, *i.e.*, you searched the literature for information about the topic and/or you carried out a laboratory or field study.

- Note that this is the only part of your thesis that will be single-spaced with the exception of Figure Legends! Everything else, including the bibliography, should be double-spaced.

If your thesis is a laboratory or field study based on original research, give a brief summary of the background most relevant to the topic. What methods did you use to investigate your problem?

List the methods, but do not describe them, unless part of the investigation was to develop a method to find out something about the topic. In the latter case, you would indicate how you went about developing the method.

Next, summarize your results, and lastly, state how your results fit into the framework of what was already known about the topic, and what, if any, further possibilities for research are suggested.

If you conducted a literature review, you will briefly summarize the background material on your topic (the material in your "Background") and then focus on what recent investigations have revealed about the topic. This will include mention of the methods that current investigators used to develop their information.

For example, if one of the current investigations was to clone the gene responsible for some genetic disorder, indicate how the gene was localized and how it was cloned.

If the function of the gene product was investigated, how was it done and what did the investigation show? End the abstract with an assessment of the current state of knowledge about your topic.

Introduction

The introduction tells the reader what the subject of your thesis is and why you chose to investigate it. This might get somewhat personal, but that is acceptable. You can talk about personal contact with the problem or with others who are involved with the problem.

Background

This is the history of your problem. How did it begin? What do we know about the problem? Who did the original work and what did they find out? You may want to discuss key experiments or studies in some detail.

Because everything in this section represents prior knowledge, ***the material you present must be documented.***

If you obtained information from a textbook or a review article, you must reference the information at the end of the sentence or paragraph that describes the information. Use parentheses and the author, date format for references.

- ***Do not quote from your sources***—paraphrase the material.

Plagiarism is unacceptable and will be cause for failure. Use the background section to define terms you think the reader will need to know to read your thesis intelligently.

Assume that your audience is another member of the class and that he or she has some background in biology and chemistry.

Be sure to provide data from primary peer-reviewed papers that are key to the understanding of your topic. Data must be supported by figures/tables/graphs (placed in an appendix) that are supplemented with figure legends and references.

If your background section is very long, you may want to use subheadings to divide the material into topics. Use the subheadings judiciously.

At the end of the background section, you will state your thesis or your goal in the upcoming section, the current investigation. You should provide a clean transition that leads seamlessly into your current investigation section.

At this point what comes next depends on whether you are writing a thesis based on ***original laboratory research*** that you conducted, or whether you are writing a ***literature review***.

For students writing a thesis based on original laboratory research, you will next include:

Materials & Methods

The next section will be a description of the methods you used to do your study. You do not need to give specific details so that someone else could exactly duplicate your study, but you do need to give a general description of what you did. You may use diagrams or flow charts. If the methods you used were published elsewhere, provide the reference(s).

Results

This is a description of your data and may include graphs, tables or pictures. Each graph, table and figure must be numbered, given a title (in bold) and a legend (in paragraph format) explaining what the parameters of the data are, what the symbols in the figure denote, and information about any statistics applied to the data, including how many data points were averaged to obtain the values represented.

Be sure to reference by number and include a description of what the figure shows in the narrative portion of your thesis.

Discussion

The discussion fits your results into the background history. Have you found out anything new? Do your results suggest any other studies or experiments that should be done?

If your results do not agree with information in the background, discuss why. Could it be experimental error or are there questionable assumptions in the background? Do not be afraid to challenge other people's work! What would you do with this problem next if you could continue to work on it?

For students writing a thesis based on a literature review, you will next include:

Current Investigations/Critical Analysis

The bulk of this section will describe the investigations that have been carried out in the last two to three years to add to the knowledge found in textbooks.

What kinds of studies are being done and what kinds of methods are investigators using? You may use diagrams to help your description of experimental set-ups and you may reproduce key data from a primary source.

If you reproduce a graph, table, or picture, it must be numbered and referenced. Include a legend explaining symbols, parameters, and statistics. The narrative section also must reference by number and include a description of what the figure shows.

This section must also include a critical analysis of all of the papers described in this section making a point of synthesizing the overall results of the scientific studies and the connections between the research presented in the

selected papers. An explanation of what the current research has added to the state of knowledge described in the background must be included. Include a brief explanation of future directions for your research topic.

All students complete the final sections of their theses by including the following:

Acknowledgements

Acknowledge help you received from others (Mentors, peer editors, colleagues, internship supervisors, research supervisors, family).

Bibliography

Your reference list will be completed using APA format (indented and double-spaced).

A complete reference must be given for each source. The reference includes the names of all authors (last name first, initials), title, editor (if appropriate), volume, exact pages for the information cited, publisher (only for books), place (only for books), and year.

Refer to the Purdue Owl: APA Formatting and Style Guide link (<https://owl.english.purdue.edu/owl/resource/560/01/>) for exact details of how to reference journal articles, textbooks, magazines, monographs, online materials, etc. Note how to reference multiple authors in the reference list **and** in the text (e.g., 2, 3, 4, 5, or 6 or more authors).

Also be sure to use the correct format for articles that you reference that were cited in other sources (e.g., “as cited in…”).

Place your thesis neatly into an appropriately sized three-ring binder for final submission.

This will become part of the Science Department Thesis Archive.

Thesis Format – Page Guidelines

Your senior thesis should be a minimum of 30 pages (excluding abstract, appendices containing figures/tables, and bibliography) and contain at least 16 primary peer-reviewed journal articles. Refer to Senior Thesis Format for more information on how to organize the thesis.

Using page set up, set your parameters to one-inch margins on all four sides, Times New Roman, 12-point font.

Do not include extra spaces between paragraphs! (Hint: Press “Shift” and “Enter” simultaneously to obtain consistent spacing between paragraphs.) **No Exceptions.**

The first page is the title page (not numbered). The second page will be the abstract and should be single-spaced (page 1). All other pages should be double spaced, Times New Roman, 12 point, with one-inch margins.

The following are guidelines for page lengths for the various sections of the thesis. Note that there is room for variation in some of the sections. As long as you stay within the range (meet the minimum page length for each section), and as long as you have 30 pages overall (excluding abstract, figures, and bibliography), you will be fine.

Please contact your Mentor if you have any additional questions.

Minimum Page Requirements (students may exceed this page requirement):

- Abstract: 3/4 – 1 page (single spaced)
- Introduction: 1 page (double spaced)
- Background: 15 pages (double spaced)
- Current Investigations/Critical Analysis (Literature Review) **or** Methods/Results/Discussion (Original Research): 14 pages (double spaced)

Bibliography – minimum of 16 peer-reviewed primary research articles plus other relevant resources (double spaced and indented, see Bedford Researcher for template).

Editing

You will work with a peer editor on the first draft of your thesis. The editor is not responsible for errors regarding content. The editor checks that all of the requirements of the thesis are present and accounted for, that the page limits have been followed, and that what is written makes sense.

The editor should point out spelling and grammatical errors and work with the author to help make the thesis make sense. If it doesn't make sense to you, it will not make sense to anyone else. Remember that the Mentor will read the thesis looking for clarity of expression and completeness of information. Any gross oversights by the peer editor will be noted and taken into account for assessment of the editing process (for which there is a separate grade).

Be helpful and considerate in your comments and work with your partner. If you run into partner problems, you must notify the Mentor before the thesis is due.

Editing a Senior Thesis – subject to change

Choosing an Editor

Each student must select a peer editor to review the first draft of your senior thesis before you write and submit your second draft to your Thesis Advisor. Alternatively, an editor might be assigned by the course instructor.

The editor should be another student in the class who is majoring in the same program as you are (e.g., Biology/Pre-Medicine, Biotechnology, or Chemistry).

The Thesis Audience

The thesis should be aimed at students enrolled in your major. This means that the author can assume that the target audience is familiar with material that is covered in the required courses of the major, but might not necessarily be familiar with courses taught as electives.

Concepts, definitions, and processes that are covered in these courses can be assumed to be familiar to the audience and need not be explained, except in a very general way to remind the reader of their context or to introduce a more-detailed discussion on the subject. You do not need to explain what an ion or a neuron or a gene or a cell membrane is.

Not everyone has taken the same upper-level electives that you have, and might need an appropriate level of background to explain your topic. If an editor requests an explanation or further detail relating to a particular topic in your thesis, be sure to include this in your second draft.

The writer's responsibility is to explain material that the audience cannot be assumed to know, and the editor's responsibility is to alert the writer to explanations that might be missing or that might not make sense as written.

Editing Logistics

A complete draft of the thesis need not be available to begin the editing process. You can edit sections of a thesis as they are completed, although the editor should read through a completed copy to make sure that everything is clear, that the ideas follow logically.

This means that the writer has to give the editor enough time to read and comment on the thesis. One week is permitted under the guidelines of the syllabus, but you can submit your first draft sooner (or in sections) to provide more time for your editor.

What to Look for in Each Section of the Thesis

Check the thesis carefully for the correct use of APA format in the text and the corresponding reference in the bibliography. Check whether the various sections (described below) follow the **page guidelines**.

Are all citations in the bibliography? Are all references in the bibliography included in the body of the text? Complete the Peer-Editing Rubric (see below) after your review and share your score with the thesis author before you submit the rubric to the course instructor. The score that you ascribe for each category should take the information outlined below into account as well as page guidelines.

The **Abstract** is a summary of the whole thesis and should give the reader a good idea of what he/she can expect to find in the text. It does not include explanations, definitions or details, but it should cover every part of the thesis.

The **Introduction** is a personal statement of why the author chose this topic and why he/she thinks it is significant.

Background lays the foundation for the explanation of the research that is to follow. This is the place to look for a description of the context of the topic, some history of the topic, definitions of terms, explanations of related processes, what is already known about the topic, and finally, a clear statement of the problem or hypothesis of the experimental investigation. If the thesis deals with some aspect of a disease, the background should include a description of the etiology of the disease. All background material must be referenced.

The **Current Investigation/Critical Analysis** or **Methods/Results/Discussion** section of the thesis describes either recent research by others or a laboratory or field investigation carried out by the authors.

In the case of a literature review thesis, descriptions of the work of other investigators must include an explanation of what methods the authors used to carry out their research as well as a review of the data or results they obtained. Referencing is a must! Original research theses must include a summary description of the experimental methods they actually used, and the data or results of the experiments.

This section must also include a critical analysis of all of the papers/research results described in this section making a point of synthesizing the overall results of the scientific studies and identifying the connections between the research presented in the selected papers/data. An explanation of what the current research has added to the state of knowledge described in the background must be included. Inclusion of a brief explanation of future directions of the research topic must be provided. If the author is reiterating the ideas of others about the state or future of the topic, look for referencing. The author is entitled to express his/her own ideas or opinions about the quality of research or the interpretation of research and is encouraged to do so. The editor should leave such discussion alone, unless he/she thinks there is something illogical or inconsistent about it.

The **Bibliography** should follow APA format. Check this carefully!!!! Remember, you are graded on your contribution as an editor. If you do not comment on a bibliography that is not written according to APA format, you will be penalized. There should be a minimum of 16 primary peer-reviewed articles (not included "as cited in" references). Do your best at trying to identify them and if you are unsure, ask the author to show you the original articles. You should be familiar with what constitutes a primary peer-reviewed article by now and you are required to review this carefully.

Peer-Editing Rubric: The Peer-Editing Exercise is worth **100 points**. **50 points** is earned based on the score you receive from your peer-editor on the following rubric.

The remaining **50 points** is earned based on your ability to peer-edit in a thoughtful and constructive manner (graded by the Mentor). Be sure to include legible suggestions in the margins of the thesis. The Mentor will grade your thesis taking into consideration whether you incorporated your editor's suggestions. This will be assessed by reviewing the final thesis and comparing it to the draft submitted to your peer editor.

Rubric for Final Thesis – Subject to Change

Name _____

The minimum page length for your final thesis is 30 pages with a minimum of 16 primary, peer-reviewed articles.

All final and bound theses must be submitted together with: 1) a turnitin.com report receipt; 2) the original marked-up Background with Mentor's comments; and 3) the peer-edited draft with peer-editor's comments.

Student demonstrates ability to:	(4) Exceeds Expectations	(3) Meets Expectations	(2) Needs Some Improvement to Meet Expectations	(1) Needs Substantial Improvement to Meet Expectations
Write appropriate Abstract 100 Points	Elegantly and concisely summarizes all of the main ideas of the thesis. 90–100	Clearly summarizes all of the main ideas of the thesis. 80–89	Clearly summarizes most of the main ideas of the thesis. 70–79	Fails to clearly summarize most of the main ideas of the thesis. 0–69
Write appropriate Introduction 100 Points	Gives an insightful explanation of topic's personal and general significance. 90–100	Gives an explanation of topic's personal and general significance. 80–89	Gives an explanation of topic's personal or general significance. 70–79	Fails to explain topic's personal or general significance. 0–69
Write at an Appropriate Level of Difficulty 100 points	Topic complexity significantly exceeds upper-level science coursework. 90–100	Topic complexity requires mastery of upper-level science coursework. 80–89	Topic complexity requires basic knowledge of upper-level science coursework. 70–79	Topic complexity requires only mid-level science coursework. 0–69
Select appropriate articles. (Background) 40 Points	Student has selected sufficient articles, including a broad coverage of background information on the topic. 36–40	Student has selected sufficient articles, including substantial, but not exhaustive, background information. 32–35	Student has selected sufficient articles but lacks some critical background information. 28–31	Student has failed to find a sufficient number of articles and lacks necessary background information. 0–27
Summarize narrative content of articles. (Background) 60 Points	For each article, the main point(s) relevant to the background are presented clearly and with apparent accuracy. 54–60	For each article, the main point(s) relevant to the background are summarized adequately. 48–53	Most articles are summarized, but some relevant information from the selected articles is missing or unclear. 42–47	The relevant main point(s) of many articles are missing or unclear. 0–41
Summarize quantitative/ graphic content of articles. (Background) 60 Points	Relevant figure(s), table(s), and/or quantitative data are presented with clear and accurate explanations. 54–60	Relevant figure(s), table(s), and/or quantitative data are presented with some explanation. 48–53	Relevant figure(s), table(s), and/or quantitative data are presented, but some are not clearly or accurately explained. 42–47	No relevant figure(s), table(s), or quantitative data are presented, or many are presented with missing or inaccurate explanations. 0–41
Think critically about articles. (Background) 55 Points	Student points out strengths and weaknesses of many articles, and raises a significant number of questions about their validity and/or applications. 50–55	Student points out strengths and weaknesses of some articles, and raises a few questions about their validity and/or applications. 44–49	Student points out strengths and weaknesses of some articles, or raises a few questions about their validity and/or applications. 39–43	Student fails to point out strengths or weaknesses of any articles, or raise questions about their validity and/or applications. 0–38

Make connections among articles. (Background) 45 Points	Student presents clear, insightful connections among many of the articles, and structures the paper to highlight these connections. 41–45	Student presents clear connections among several of the articles, and structures the paper to highlight these connections. 36–40	Student presents some connections among articles, but structure does not highlight these connections. 32-35	Student fails to make connections among more than a few articles. 0-31
Present analysis clearly and use correct citation format according to APA guidelines for in-text citations and reference list. (Background) 40 Points	Paper is written in a clear and engaging style, and follows conventions of good scientific writing and meets Background Format Guidelines (Capstone Manual) in nearly all instances. Resources are cited correctly in narrative and in the reference list. 36-40	Paper is clear and has only a few errors of scientific writing convention and meets Background Format Guidelines in nearly all instances. No more than three resources are cited incorrectly in the narrative and/or the reference list. 32-35	Paper is mostly clear and follows scientific writing conventions more often than not and meets Background Format Guidelines in most instances. More than three but less than ten resources are cited incorrectly in the narrative and/or the reference list. 28-31	Paper is unclear and/or fails to follow conventions of scientific writing and/or does not meet Background Format Guidelines. Ten or more errors in citations in the narrative and/or the reference list are made. 0–27
Select appropriate articles. (Current Investigations) 80 Points	Student has selected sufficient articles, including a broad coverage of background information on the topic. 72–80	Student has selected sufficient articles, including substantial, but not exhaustive, background information. 64–71	Student has selected sufficient articles but lacks some critical background information. 56–63	Student has failed to find a sufficient number of articles and lacks necessary background information. 0–55
Summarize narrative content of articles. (Current Investigations) 120 Points	For each article, the main point(s) relevant to the background are presented clearly and with apparent accuracy. 108–120	For each article, the main point(s) relevant to the background are summarized adequately. 96–107	Most articles are summarized, but some relevant information from the selected articles is missing or unclear. 84–95	The relevant main point(s) of many articles are missing or unclear. 0–83
Summarize quantitative/ graphic content of articles. (Current Investigations) 120 Points	Relevant figure(s), table(s), and/or quantitative data are presented with clear and accurate explanations. 108–120	Relevant figure(s), table(s), and/or quantitative data are presented with some explanation. 96–107	Relevant figure(s), table(s), and/or quantitative data are presented, but some are not clearly or accurately explained. 84–95	No relevant figure(s), table(s), or quantitative data are presented, or many are presented with missing or inaccurate explanations. 0–83
Think critically about articles. (Current Investigations) 110 Points	Student points out strengths and weaknesses of many articles, and raises a significant number of questions about their validity and/or applications. 99–110	Student points out strengths and weaknesses of some articles, and raises a few questions about their validity and/or applications. 88–98	Student points out strengths and weaknesses of some articles, or raises a few questions about their validity and/or applications. 77–87	Student fails to point out strengths or weaknesses of any articles, or raise questions about their validity and/or applications. 0–76
Make connections among articles. (Current Investigations) 90 Points	Student presents clear, insightful connections among many of the articles, and structures the paper to highlight these connections. 81–90	Student presents clear connections among several of the articles, and structures the paper to highlight these connections. 72–80	Student presents some connections among articles, but structure does not highlight these connections. 63–71	Student fails to make connections among more than a few articles. 0–62

Present analysis clearly and use correct citation format according to APA guidelines for in-text citations and reference list. (Current Investigations)	Paper is written in a clear and engaging style, and follows conventions of good scientific writing and meets Current Investigations Format Guidelines (Capstone Manual) in nearly all instances. Resources are cited correctly in narrative and in the reference list.	Paper is clear and has only a few errors of scientific writing convention and meets Current Investigations Format Guidelines in nearly all instances. No more than three resources are cited incorrectly in the narrative and/or the reference list.	Paper is mostly clear and follows scientific writing conventions more often than not and meets Current Investigations Format Guidelines in most instances. More than three but less than ten resources are cited incorrectly in the narrative and/or the reference list.	Paper is unclear and/or fails to follow conventions of scientific writing and/or does not meet Current Investigations Format Guidelines. Ten or more errors in citations in the narrative and/or the reference list are made.
80 Points	72–80	64–71	56–63	0–55

Final Thesis (1200 points)

Evaluation Item	Total Possible Points	Points Awarded
Abstract	100 points	
Introduction	100 points	
Appropriate Level of Difficulty	100 points	
Background	300 points	
Current Investigations/Critical Analysis (or Materials/Results/Discussion)	600 points	
Total possible points	1200	

Poster Draft, Presentation, and Oral Defense Guidelines

Poster Draft

You are required to hand in a draft that clearly explains what you plan to include in your poster for public presentation. You must use the layout described in the next section of this *Handbook* (Information to Include on your Poster) as a framework for your information.

Indicate in your draft which information (include your references) you will include from your thesis in your poster. Divide your draft into subheadings that reflect the layout shown below. Determine which specific data you will display.

Where and when will the Poster Presentation for Senior Seminar take place?

The Poster Presentation will take place during the annual Undergraduate Arts, Research, and Scholarship Symposium in the spring. An invitation will be extended to the entire college community.

Please invite your family and close friends to share this important accomplishment with you. At the end of the poster session, please take your poster to Iadarola Center Room 212 where they will be displayed until your **Oral Defense**.

What do you do at the Poster Presentation?

Students will stand beside his/her poster prepared to discuss the topic and content of the poster with anyone who happens by and expresses interest in the topic. Your evaluators will attend and you should be prepared to describe your poster in great detail to your two evaluators.

What should the poster look like?

Scientific Posters are actually made up of different pieces of paper containing topic information, tacked, taped, or glued up in a logical and visually pleasing pattern on a supporting background.

You will be using a printer plotter so that your entire poster is printed on one large page. Have a look at past posters, which are mounted in the corridors in the Iadarola Center for Science, Education, and Technology to get some ideas.

The purpose of the poster is to convey the information effectively in a visual manner. The poster boards on which the information is to be mounted measure **32" x 48"** (**note that this is different from what is indicated on the Symposium website**). The exact design of each poster will depend on whether a laboratory research-based investigation or literature review is being presented. Directions for the poster are outlined below and include sample poster layouts.

You will also participate in an **Oral Defense** after you have completed the Poster Presentation Day. Questions asked during your Oral Defense may cover how experiments were done, interpretation of the data, why you chose your topic, what next, etc.

You might even be asked about fundamental scientific knowledge (learned in your required courses for your major) relating to your topic.

Information to Include on Your Poster

Note: You must follow these specific guidelines to receive full credit!

- A **Banner Heading** giving an appropriate title of the poster that adequately captures the nature of your research. Under the title, in smaller letters should be (from left to right): Your Name, Cabrini College – Science Department, Faculty Mentor: Mentor's Name (do not use academic titles, *i.e.*, do not use Dr. or Professor).

Note: the Mentor is the Cabrini College faculty member with whom you consulted in preparation of your Senior Thesis.

- An **Abstract** of the information is presented. The abstract, should be one paragraph in length and should summarize what the poster (not your thesis) will discuss. As with all printed text material on your poster, it should be easily readable from a distance of 3 to 4 feet. Adjust the font size on your computer to produce an appropriate size.
- **Background** about the topic. Text and some of the information will be in graphic form: pictures, diagrams, graphs, bar diagrams, tables, and figures. All graphic materials must be labeled clearly so that the viewer understands what is being presented. **Do not** use paragraph format. Condense to bulleted items. Coordinates of graphs and headings on tables and diagrams must be specified, and there must be a heading above the figure stating what the figure shows and a legend below the figure explaining in one or two sentences how the data were derived or stating any special conditions, number of samples, etc. Computer-graphics programs can be used to produce professional-looking graphs. Reference your material appropriately.
- **Data**. Include picture/tables/graphs that describe the experiments carried out to investigate your topic. You must describe *two* separate studies. Be sure to include a figure legend underneath each one and an appropriate reference at the end of each figure legend.
- **Conclusion**. In bulleted format, list the major conclusion(s) of your study or research. This section should be concise and emphasize what you wish your readers to "take home" as the message of your work.
- **Future Directions**. A few sentences about what more could be learned; what is still not known or understood.
- **References**. List complete bibliographical references in alphabetical order for all your source materials. Only list the references associated with the poster information. Do not post the full bibliography of your senior thesis. Since your poster is based on a laboratory or field investigation which you performed, the primary source is your own data and you will require only a few reference texts, journal articles, or book citations.
- **Acknowledgments**. You should acknowledge the assistance of others in completing your project. If your project was done in a large research laboratory or was part of a continuing project, use this section to make it clear that not all the research presented in your poster was done by you.

Poster Evaluation

Posters will be evaluated by the course instructor along with two other faculty members during your oral defense which is usually during finals week. A single rubric will be used for the Poster and the Oral defense (see below).

Posters will be graded on the completeness of content, your ability to discuss the content, and the logic and arrangement of the poster materials. Refer to rubric for expectations.

Final Suggestions for Posters

Posters are visual displays and should be organized using visual grammar and analysis. It is important to arrange text, illustrations, and other graphic elements into a cohesive whole for easy comprehension in order to communicate your message with ease and clarity.

Overreliance on verbal descriptions defeats the purpose of a poster, which is to **display ideas graphically**.

The poster should be readable at a distance of 3–4 feet and be colorful and attractive.

Below is a sample poster, but you will be provided with templates from previous students which will facilitate greatly how you organize your material. Your posters will vary depending on topic, style, and personal preferences.

Note: This is not drawn to scale. Your poster size will be 32" wide x 48" high and templates will be provided.

Poster Title			
Author	Cabrini College Science Department – Your Major	Mentor: Name – No Titles (Do not state Dr., Mrs., etc.)	
Abstract	Methods	Data/Picture/Graph/Legend	Conclusions
Background	Data/Picture/Graph/Legend	Data/Picture/Graph/Legend	Future Directions References
	Data/Picture/Graph/Legend	Data/Picture/Graph/Legend	Acknowledgements

Poster/Oral Defense Rubric

Student demonstrates:	(4) Exceeds Expectations	(3) Meets Expectations	(2) Needs Some Improvement to Meet Expectations	(1) Needs Substantial Improvement to Meet Expectations
<p>Appropriate poster format (including organization and neatness)</p> <p>50 points</p>	<p>Poster layout and design provide excellent visual appeal, logical flow between sections, and concise articulation of major points.</p> <p>45–50</p>	<p>Poster layout and design are neat, logical, and concise.</p> <p>40–44</p>	<p>Poster is lacking in neatness, logical flow, or concise articulation.</p> <p>35–39</p>	<p>Poster is lacking in two or more of the following: neatness, logical flow, or concise articulation.</p> <p>0–34</p>
<p>Oral communication skills (including clarity and professionalism)</p> <p>50 points</p>	<p>Student demonstrates exemplary command of subject matter, engages audience, and narrative provides a seamless flow of information.</p> <p>45–50</p>	<p>Student demonstrates familiarity with subject matter, engages audience, and provides logical transitions between sections.</p> <p>40–44</p>	<p>Student is lacking in either familiarity with subject matter, ability to engage audience, or logical transitions between sections.</p> <p>35–39</p>	<p>Student is lacking in two or more of the following: familiarity with subject matter, ability to engage audience, or logical transitions between sections.</p> <p>0–34</p>
<p>Ability to summarize relevant background information</p> <p>50 points</p>	<p>Student provides compelling, relevant, and engaging foundational concepts to frame current studies, and summarizes this information clearly and concisely.</p> <p>45–50</p>	<p>Student provides interesting and relevant foundational concepts to frame current studies, and summarizes this information clearly and concisely.</p> <p>40–44</p>	<p>Student either fails to provide interesting and relevant foundational information, or fails to summarize clearly and concisely.</p> <p>35–39</p>	<p>Student both fails to provide interesting and relevant foundational information, and fails to summarize clearly and concisely.</p> <p>0–34</p>
<p>Ability to summarize methods and results</p> <p>50 points</p>	<p>Student comprehensively articulates each study's methodologies and major findings in a clear and engaging manner.</p> <p>45–50</p>	<p>Student clearly highlights central aspects of each study's methodologies and major findings.</p> <p>40–44</p>	<p>Student either fails to present information that appropriately highlights each study's central theme, or fails to present information clearly.</p> <p>35–39</p>	<p>Student both fails to present information that appropriately highlights each study's central theme, and fails to present information clearly.</p> <p>0–34</p>

<p>Ability to synthesize information, draw conclusions, and reflect on future directions</p> <p>50 points</p>	<p>Student demonstrates excellent critical and analytical skills in highlighting the significance, strengths, and weaknesses of studies and synthesizes this information to suggest thoughtful future approaches.</p> <p>45–50</p>	<p>Student highlights the significance, strengths, and weaknesses of studies, and suggests appropriate future approaches.</p> <p>40–44</p>	<p>Student either fails to highlight the significance, strengths, and weaknesses of studies, or fails to suggest appropriate future approaches.</p> <p>35–39</p>	<p>Student both fails to highlight the significance, strengths, and weaknesses of studies, and fails to suggest appropriate future approaches.</p> <p>0–34</p>
<p>Ability to answer questions clearly and accurately</p> <p>75 points</p>	<p>Student demonstrates exemplary curricular content knowledge, applies this information accurately and creatively, and demonstrates strong problem-solving skills.</p> <p>68–75</p>	<p>Student demonstrates curricular content knowledge, applies this information accurately, and shows problem-solving skills.</p> <p>60–67</p>	<p>Student either fails to accurately apply curricular content knowledge or fails to show problem-solving skills.</p> <p>35–59</p>	<p>Student both fails to accurately apply curricular content knowledge and fails to show problem-solving skills.</p> <p>0–52</p>

Summary of Course Evaluation for Fall Semester

Assignment	Points
Annotated Bibliographies – first set (3 references) and second set (5 references)	100
Oral Progress Report I (Points include Participation in Progress Reports and Attending Mentoring Sessions)	150
Progress Checkpoints (x2); 5 pages per mentoring session	100
Background Outline	100
Remaining 8 Annotated Bibliographies	100
Background for Undergraduate Thesis	250
Total	800

Summary of Course Evaluation for Spring Semester

Assignment	Points
Thesis Outline – First week of class	100
Oral Progress Report II	150
Progress Checkpoints #3 and #4; 5 pages per mentoring session	100
Poster Draft	100
In-class and reflective essays	100
Peer-editing	100
Thesis	1200
Participation in Undergraduate Arts, Research, and Scholarship Symposium (includes a poster outline submitted prior to design and print-out of poster. Poster must be previewed by mentor before printing.)	100
Poster Evaluation/Oral Defense (three faculty members, including Thesis Advisor. See information about Poster and Oral Defense in Capstone Handbook)	325
Laboratory Skill Practicum OR Social Justice Essay Assignment (depending on departmental assessment cycle)	75
Total	2350

Overall course evaluation based on **3,150 points**:

Percentage (%)	Total Points	Letter Grade
93–100	2929.5 – 3150	A
90–92	2835 – 2929.49	A–
87–89	2740.5 – 2834.9	B+
83–86	2614.5 – 2740.49	B
80–82	2520 – 2614.49	B–
77–79	2425.5 – 2519.9	C+
73–76	2362.5 – 2425.49	C
70–72	2205 – 2362.49	C–
67–69	2110.5 – 2204.9	D+
60–66	1890 – 2110.49	D
Less than 60	Less than 1890	F

Senior Seminar Thesis Topics

Cabrini College Science Department 2002–13

Students noted with an asterisk * wrote their thesis based on **original research** conducted with faculty at Cabrini College or with their site supervisors at off-campus locations.

2002–03 (5)

1. Heather Buonacuore: Cellular Prion Protein and the Induction of Neuroprotective Signals
2. Brandon Lawler: Biological Indicators
3. Helen Morris: The Effect of Fire Suppression on Forest Ecosystems
4. Stefanie Rittenhouse: Invasive Plant Species:
The Establishment of *Phragmites australis* decreases biological diversity in Wetlands
5. Nicole Wiand: Systemic Lupus Erythematosus: Consequences of Cell Death

2003–04 (5)

1. Erin Conley: Avascular Necrosis of the Femoral Head:
A Study of Sprague–Dawley Rats and the Effects of Hyperbaric Oxygen Treatments and Non–weight Bearing Treatments
2. Jennifer Howitz: Ankylosing Spondylitis and its Relationship with HLA–B27:
Misfolding of the B Pocket, Arthritogenic Peptides, and Transgenic Rats
3. Snigdha Rai: Hepatitis C: Lymphocytes and their Role in Chronic vs. Recovered Hepatitis C Patients
4. Emily Silvester: Preventing the Expression of OspA and OspC in *Borrelia burgdorferi* Spirochetes from Tick Vector to Mammalian Host: A Vaccine Strategy to Prevent Lyme Disease
5. *Dolores Tornambe: The Expression of Neuro M mRNA in the Pregastrulating Chick Epiblast

2004–05 (8)

1. *Lara D'Alessandro: Determining the Number of Expressed rRNA Genes in *Halosimplex carlsbadense*
2. Guethara Joachim: Hemochromatosis:
The Severity of Iron Accumulation in an HFE Knockout Model of Hereditary Hemochromatosis
3. Geoffrey Kloc: The Skin Blistering Disease Epidermolysis Bullosa
4. Christine LoSardo: The Hemagglutinin of Canine Distemper Virus and Current Vaccine Strategies
5. Nicole Magdy: Adoptive Immunotherapy Shows Great Potential in The Eradication Of Cancerous Tumors
6. Kristen Lee Reichenbach: The Use of fd Virions and E2 Scaffolds to Elicit an Immune Response Against HIV/AIDS
7. Heather St. Amour: Duchenne Muscular Dystrophy (DMD): The Role of the Dystrophin Gene
8. Stephanie Vales: Crohn's Disease and the Role of the NOD2 Protein

2005–06 (6)

1. Meghan Brown: New Treatment Possibilities for Glycogenesis Type II: Pompe Disease
2. Alexandra Carroll: Inhibition of CCR4 and CXCR4 as New Direction in the Treatment of HIV
3. Marisa Castellana: Immunomodulation as a Therapy for Melanoma:
The Role of Costimulation and Pro–Inflammatory Cytokines
4. Linda Granger: Human Papillomavirus (HPV) & Causative Link to Cervical Cancer:
Insights to Treatment & Prevention Research
5. Bevin McGettigan: Using the Hammerhead Ribozymes to Target the mTER as an Anti–Cancer Treatment
6. Billy Williams: Alzheimer's Disease: Possible Role of Curcumin in the Prevention

2006–07 (9)

1. Kristina Bisacquino: Human Progeroid Syndromes: Disease Manifestations and Treatment
2. Stephanie Flaherty: The Anatomical and Neuromuscular Differences Between Male and Females that Make Females More Prone to ACL Injury
3. Kathleen Grant: The Role of Interleukin–17, Interleukin–1, and TNF–alpha in the Pathogenesis of Rheumatoid Arthritis
4. *Lucinda Hughes: Angiotensin–II Induced Phosphorylation Patterns in Chinese Hamster Ovary Cells: Investigating a Role for Intracrine Signaling Pathways
5. Katie Lowther: The Role of CD13/APN in Pathological Angiogenesis
6. *Mukti Patel: Investigation of Effects of 7,12–Dimethylbanz[a]anthracene on Cell Mediated Cytotoxicity in *Eisenia fetida*: An Invertebrate Model to Study Innate Immune Response
7. Karen Randazzo: The Synthesis of Vitamin D and Importance of Pericyclic
8. Aubrey Smith: Plasmodium Falciparum Malaria in Africa: Treatment and Prevention
9. *Allison Superneau: The Identification of Downstream Signaling Partners to PTHrP in the Mammary Gland

2007–08 (14)

1. Victor Bonfiglio: Advances in Early Diagnosis and Treatment of Prostate Cancer
2. Sarah Burke: The Synthesis of Aqueous–Soluble Quantum Dots for In Vivo Imaging: A Literature Review
3. James Capobianchi: Drug Addiction in the Human Brain
4. *Clayton Cottman: The Relationship of Gastric Pepsin in the Bronchia Lavage to Respiratory Symptoms in Children
5. *Nicole DeRogatis: The In Vitro Effects of Human Pro–Inflammatory Cytokines Granulocyte Macrophage–Colony Stimulating Factor and Interleukin–1 Beta on Natural Killer–like Responses in *Eisenia hortensis*
6. *Jenna Dowd: Cortisol and Its Effect on Memory Recall
7. Gregory Nacarelli: Aberrant Gene Expression Due to a Loss of Heterozygosity in HNPCC
8. Kaitlin Novelli: The Underlying Biological Mechanisms Involved in Insulin–Dependent Diabetes Utilizing the NOD Mouse Model to Find a More Effective Therapeutic Drug
9. Christi O’Cain: Cross–protective Immunity to the Highly Pathogenic H5N1 Influenza Strain Acquired Through Vaccination with Seasonal and Adenoviral–Based Recombinant Viral Strains
10. Stacey Roebuck: Periodontal Treatment is an Easy Solution in the Prevention of Tooth Loss
11. James Seamen: Stressed to Remember or Stressed to Forget?
12. *Miriam Smith: The Role of Tissue Plasminogen Activator and Annexin II in Breast
13. Lynn Talley: Comparative Analysis of Selective Serotonin Reuptake Inhibitors (SSRIs) for Treatment of Premenstrual Dysphoric Disorder (PMDD) Symptoms
14. Giulia Tinari: Nutrition and Its Effects on Macular Degeneration

2008–09 (21)

1. *Zach Berman: Using DNA Barcoding to Identify Crayfish Species
2. Michele Canavan: Sublingual Immunotherapy for the Treatment of Allergies
3. Nikole Czapp: Prion Pathogenesis: Spongiform encephalopathies and Potential Therapeutics
4. *Kacie Fick: Evaluating the use of Warm Media versus Cold Media at the Thaw of a Chinese Hamster Ovary (CHO) Cell Line in Pre–Culture
5. Sarah Gaglione: Reactive Attachment Disorder and the Effects Caused by Long–Term Cortisol Exposure
6. *Laura Goodfield: An Analysis of the Effect of PAMPs on Phagocytosis by Hyaline Amoebocytes in the Earthworm *Eisenia hortensis*
7. Laura Hennessy: Ebola hemorrhagic Fever: Effects on the Immune System
8. Nicole Hearn: The Role of Pancreas Transplants in the Treatment of Diabetes mellitus

9. *Katrina Hill: Effects of Recombinant human cytokines gamma interferon, interleukin–10 and interleukin–12 on the Natural Killer–Like Response in *Eisenia hortensis* and the Method of Cytotoxicity
10. Jonathan Irvin–Hannum: Bacteriophage Therapy for Uropathogenic *Escherichia coli* Infections
11. Matthew Leitch: The Genetic Factors of Alzheimer’s Disease
12. Erin McCole: Novel Fluorometric and Colorimetric Methods for Encoding and Screening Combinatorial Libraries
13. Brittany McIntyre: The Effects of Infliximab on Crohn’s Disease
14. Kayla Messer: Testing the Adaptor Hypothesis Through Unnatural Polypeptide Synthesis by Using a Purified Translation System
15. Lisa Mills: The Mitochondrion: A Look into Mitochondrial DNA Inheritance and its Use in the Proving of the Out of Africa Theory of Human Evolution and Migration
16. *Brenden Nosratbakhsh: Preservation of the Desert Tortoise (*Gopherus agassizii*): The Consequences and Spread of Upper Respiratory Tract Disease
17. Matthew Perks: Nanomaterials Engineering for Hydrogen Storage
18. Kristie Pinos: The Role of Antihistamines in the Treatment and Prevention of Allergic Reactions
19. Christine Regan: Multidrug–Resistant tuberculosis: A Global Emergency
20. Veronica Rigler: The Effects of the CFTR Gene on Cystic Fibrosis Clinical Manifestation
21. Kallyn Seidler: Marfan Syndrome: An Analysis of the FBN1 Gene and its Physiological Effects on the Body

2009–10 (10)

1. *Emily Bongiorno: An In Vitro Investigation of the Effects of Corticosterone and CdCl₂ on Hsp70 Expression in the Earthworm *Eisenia hortensis*
2. Karly Brennan: Adhesion and Antigenic Variation Mechanisms as Recombinant Vaccine Candidates for Human Babesiosis
3. *Steven Forrester: Isolation and Characterization of 16 New Mycobacteriophages
4. Dorothy Kerzner: The Specific Immune System Response of the Host against Lymphatic Filariasis
5. Lynda Kaufmann: Breast Cancer: an Analysis of the Cancer Causing Mutations in the BRCA The Specific Immune System Response of the Host against Lymphatic Filariasis
6. *Dana Lewis: 16S rRNA Expression and Growth Characteristics of *Halosimplex carlsbadense*
7. Colleen McGee: Insulin Glargine in the Treatment of Type 1 Diabetes
8. Jamie Price: Xenotransplantation: A Focus on Pig–to–Human Lung Transplantation and the Effects of Von Willebrand Factor
9. Monica Souders: Prenatal Alcohol Exposure has Consequences to the Brain that Last into Adolescence
10. *Elizabeth Williams: *Chlamydomonas reinhardtii* Growth Rate Response to Exposure to Selenium

2010–11 (22)

1. Ambreen Alladin: Systemic Endothelial Damage Leading to Increased Activation of the Blood Coagulation Cascade as the Origin of Preeclampsia
2. Frank Bearoff: Properties, Synthesis, and Applications of Graphene: A Two Dimensional All Carbon Nanomaterial
3. *Erin Blake: An In Vitro Study Investigating Apoptosis Induction of Coelomocytes in the Earthworm *Eisenia hortensis* Using the TUNEL Assay
4. *Christopher Catagnus: Phage Ecology
5. Melissa Gambino: Treatment and Therapy for Cerebral Palsy
6. Aimee Giaccio: The Effects of Azithromycin Treatment Towards *Pseudomonas aeruginosa* Infection from Cystic Fibrosis
7. Ryan Gutzler: Complete Correction of Hyperphenylalaninemia Following Liver–Directed Recombinant AAV2/8 Vector–Mediated Gene Therapy in Murine Phenylketonuria
8. Kristen Hughes: Multiple Myeloma: Addition of Curcumin to Chemotherapy Treatments
9. *Catherine Mageeney: Genomic Characterization of a Novel Mycobacteriophage
10. Kathleen Manning: Profiling the Predatory factors of *Carhcarodon carcharias*

11. *Tara Milito: Myo/Nog Cells and Their Effects on Health Complications
12. Madeleine Minutillo: Catalysis of a Pericyclic Reaction via Chromate Mutase
13. Glen Moran: Many Health Risks are Related to Hyperglycemia: 1,5-Anhydroglucitol Can be Part of a Comprehensive Plan to Monitor Glycemic Control
14. *Timothy Nacarelli: Changes in Mitochondrial membrane Potential Induced by Pathogen-Associated Molecular Patterns in the Earthworm *Eisenia hortensis* using Flow Cytometric analysis
15. Christopher Orlando: Accutane and its Effect on the Brain, Psychosis, and Eye
16. Stephanie Recklau: Diagnostic Tools to Treat Tuberculosis in Developing Countries
17. Emily Cate Schaffer: Ankle Injuries: Grades, Patterns, Diagnosis, Treatment and Rehabilitation
18. Derreck Shenk: Cystic Fibrosis: The Effects of CFTR Gene Mutations on the Inflammatory Response
19. *Heather Stanley: Small Subunit Gene Divergence in *Halosimplex carlsbadense* is an Adaptation to Different Growth Conditions
20. Sarah Van Cleve: Biodegradable Plastics: Soy Protein as a Petroleum Alternative
21. Kaitlyn Wilson: Chronic Fatigue Syndrome
22. Marie Zoccola: Understanding the Basics of Epithelial Barrier Function in Different Disease Models and the Role of Proton Pump Inhibitors

2011–12 (14)

1. Courtney Abel: The Transition of Chemical Damage from in the Atmosphere from Ozone Depletion to Greenhouse Gases
2. Janice Brown: Stem Cells as a Cure for Diabetes
3. Alaina Conturso: Retinitis Pigmentosa: Calpain is a Major Culprit Driving Photoreceptor Cell Death
4. Justin Gonzales: Tissue Engineering: An Analysis of Neural Tissue Reconstruction
5. Colleen Kelly: Factors Affecting the Rate of Decomposition and Arthropod Succession, Particularly the Effects of Wrapping a Carcass and Submersion of a Carcass in Water Can Have on These Two Determinants of Post-Mortem Interval (PMI)
6. Danielle Kulich: The Evolution of Canine Parvovirus: Evidence to Update Vaccines
7. Jennifer Lyons: Environmental impacts of transgenic agricultural crops
8. Alex Lefebvre: Smoking Cessation Drugs: Metabolism Across and Within Species
9. Maureen Hammond: Drug-induced Liver Injury: The Search for Better Diagnostic, Prevention, and Treatment Methods
10. Ashton Kazlo: The Effect of siRNA on the Development of Lung Cancer
11. Elisabeth Kelly: Xenotransplantation: A Step Forward or a Last Resort
12. Sarah Rocco: Molecular Dynamics of Monoamine Transporter Proteins: Searching for a Mechanism
13. Lindsay Spaeder: Investigating the Use of Hydrophobic and Hydrophilic Polymers in Extended Release Matrices of Tablets Prepared By Direct Compression or Wet Granulation
14. Jesse Vivian: Cystic Fibrosis and Cystic Fibrosis Membrane Regulator: Recent Developments

2012–13 (17)

1. Levent Beken: Trypanosomes and African Sleeping Sickness
2. Gabrielle Bruno: vCJD Progress in the Search for an Effective Therapy
3. Benjamin Danner: The Necessity for Onboard Urine Analysis on Long Duration Space Missions
4. Gabriella DeMichele: RET Proto-oncogene Mutation Seen in Multiple Endocrine Neoplasia and Medullary Thyroid Carcinoma
5. Amar Desai: Prion Diseases
6. Colleen Detweiler: Bacteriophage Therapy as a Listeriosis Treatment
7. Matthew Doyle: The Use of Phage display for Cancer Treatment, Diagnosis, and Research
8. *Nichole Hanman: The role of Lp-PLA₂ in Macrophage Recruitment and Activation
9. Ji-il Jeon: Vaccine Options for the Treatment of West Nile Virus
10. Ryan Juhring: Current Treatment Options for Multiple Sclerosis

11. Charniece Knight: The Effects of Resveratrol and Dietary Restriction on Lifespan
12. Nikie McCabe: The Evaluation of Deep Brain Stimulation for Patients with Parkinson's Disease
13. Alyssa Newman: The Effects of Mouth Guards on Athletic Performance
14. Michael Palatano: Cholinesterase Inhibitors: A Review of Therapeutic Medications for the Treatment of Alzheimer's Disease
15. Alexandra Tralie: A Review of the Relationship Between Chronic Obstructive Pulmonary Disease and Cardiovascular Events
16. *Richard Tumminello: Heat Shock Induces ROS Production and Histone Phosphorylation in Coelomocytes of *Eisenia hortensis*
17. Donna Wodarski: Alzheimer's Disease: Epigenetic changes with Age

2013–14 (12)

1. Lauren Ciccariello: Water Desalination Processes
2. Michelle Cordero-Blanco: Parkinson's Disease and Non-Traditional Exercising Treatments
3. Trevor Cross: Removing Polycyclic Aromatic Hydrocarbons from Aged Soils: Exploration of Rhamnolipids
4. Tariq Fares: Venom, Nature's Medicine
5. Madeline Foster: Systemic Lupus Erythematosus: Belimumab, the Opening of a New Door in Treatment
6. Emma Gilmartin: Bisphosphonate Use and Other Treatment Options for the Genetic Disease Osteogenesis Imperfecta
7. John Hoffnagle: The Internal Ecosystem of Carnivorous Pitcher Plants
8. *Deborah Moran: The Proteogenomics Refinement of Mycobacteriophage Genomes Using C Cluster Phages
9. Sydney Taylor: The Regulation and Structure of Protein Kinase C Isoforms
10. Paola Tinari: Selective Laser Trabeculoplasty: A Treatment for Glaucoma
11. Kim–Li Tran: Rhodium Catalyzed Asymmetric Hydrogenation of L-DOPA
12. Amy Waxman: Chemical Analysis of Steviol Glycosides

2014-2015 (Titles to be announced)

1. Patricia Afram:
2. Tara Brennan:
3. Sarah Carzo:
4. Olivia Ciallrella:
5. Shannon Cook:
6. Jennifer Farina:
7. Joseph Potesta:
8. Cristabel Ruiz:
9. Stacie Shaner:
10. Tamara Todorovic:
11. Joseph Whip:
12. Michelle Zajko:

Appendix I

Mentoring Sessions – Senior Seminar

Fall and Spring Semesters (two sessions per semester)

Mentoring sessions are a mandatory component of your Progress Report and make up 30/150 points as part of that assessment. Please bring this form with you when you meet with your thesis mentor and obtain a signature to verify the time that you have spent with them during the two required mentoring sessions.

Submit this form to your course professor on the day of your Progress Report in order to receive credit for attending mentoring sessions.

Also, be sure to bring your 5 pages of new text to each mentoring session as part of your Progress Checkpoint.

Name _____

Mentor's Name _____

First 75-minute Mentoring Session

Date _____ Start Time _____ End Time _____

Mentor's Signature _____

Second 75-minute Mentoring Session

Date _____ Start Time _____ End Time _____

Mentor's Signature _____



This Senior Seminar manual was written and is periodically updated by Dr. Sheryl L. Fuller–Espie, Professor of Biology, Cabrini College.

Please forward ideas or recommendations to her attention at sfuller-espie@cabrini.edu.

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