

## ARTICLE

# “Writing in Neuroscience”: A Course Designed for Neuroscience Undergraduate Students

**Joyce Adams**

*College of Family, Home and Social Sciences, Brigham Young University, Provo, UT 84602.*

Although neuroscience students may learn to write in a generic fashion through university writing courses, they receive little training in writing in their field. Here I describe a course that was created at the request of a Neuroscience Department with the intent to teach neuroscience students how to write well in their discipline. I explain the purpose for creating the “Writing in Neuroscience” course and offer a brief overview of the course curriculum, including pertinent pedagogical outcomes for such a course. I describe in depth the major assignment for the course, the literature review, and provide examples of paper titles that

students wrote to fulfill the assignment. I briefly describe other relevant course assignments. I evaluate the course and include an overview of who should teach such a course, what support might be helpful, and what can be learned from formative assessment of the course. Using these insights can help others determine whether such a course is a good fit for them.

*Key words: writing in neuroscience; teaching writing; neuroscience genres; writing in the disciplines*

Good writing is important to neuroscience students, regardless of the career they choose. For example, in a classic review of the needs of physicians, Muller (1984) reported that “writing and communication skills are perhaps the most fundamental skills a physician can have” (as cited in Holmes and Lin, 1992, p. 83). The importance of good writing skills to those in neuroscience professions is evident: articles have been written to guide scientific writers to write more clearly (Goldbort, 2001; Matthews et al., 2000; Peat et al., 2002) and workshops have been held at the annual gatherings of the Society for Neuroscience to address such topics as writing, editing, grant writing, teacher preparation, and publishing in science and writing manuscripts.

Because of this emphasis on good writing skills, neuroscience pre-professionals should not postpone gaining proficiency in writing until entering graduate or medical school when they will be busy learning and implementing other skills relating to their future practices. Instead, neuroscience students should accrue and use writing skills as undergraduates. Because the Neuroscience Department at Brigham Young University (BYU) recognized the need for their undergraduates to write well, they questioned whether the advanced writing course the neuroscience students were currently taking from the English Department was the most helpful option. As a result, representatives of the Neuroscience Department approached me, the Writing Specialist for the College of Family, Home and Social Sciences and requested that I create the “Writing in Neuroscience” course, which I have now taught for the past two years. BYU students are required to complete a freshman composition course or its equivalent, and a second course, advanced writing, for juniors and seniors, which focuses on writing in the disciplines. The new “Writing in Neuroscience” course replaces the more general Technical Writing class, and therefore, targets junior or senior neuroscience students

who need to complete their university-required advanced writing course.

Given its creation in cooperation with writing experts and neuroscience faculty, this course can serve as a model for others who want to support neuroscience students’ efforts to write well in their field. For those who may consider having a dedicated Neuroscience Writing course, it is helpful to more fully understand the purpose for creating the class and the curriculum used in teaching the course. An evaluation of the experience may offer insights in preparation for the creation of such a course.

## PURPOSE FOR CREATING THE “WRITING IN NEUROSCIENCE” CLASS

To support the Neuroscience Department’s decision to improve student writing, I first interviewed the Neuroscience Department administrators to determine the types of writing that neuroscience students were currently doing as undergraduates. I discovered that students did almost no writing in their neuroscience courses. In addition, students were generally not exposed to neuroscience research until they were nearly through with their undergraduate program, if at all. Students were, for the most part, unfamiliar with neuroscience journals and scholarly articles until their senior year. Since few BYU neuroscience courses require any type of written assignment, students do not receive significant writing instruction from neuroscience faculty.

Most neuroscience students at BYU had only one or two classes in which they received writing instruction; they took these courses usually in the English Department, where they were taught some universal principles of good writing, but not how to write in the discourse of the field. This meant that neuroscience students were not writing in their discipline in either their advanced writing course or in their undergraduate neuroscience courses. The creation of the “Writing in Neuroscience” class seemed to be at least a partial remedy to assist neuroscience students to write well.

## BRIEF OVERVIEW OF THE “WRITING IN NEUROSCIENCE” COURSE CURRICULUM

With the commitment of the Neuroscience Department to help their students learn to write in their field, I created the curriculum for the new “Writing in Neuroscience” course.

This course should assist a neuroscience student in reading the scholarly literature in the field and in understanding how to respond to it.

**Pedagogical Outcomes to Guide Student Learning.** The “Writing in Neuroscience” course is for neuroscience majors only; it fulfills the 3-credit university advanced writing requirement, and complements the coursework for neuroscience. It carries a Neuroscience course designation (Neuroscience 316). The course does not increase the number of credit hours for students, since it simply replaces a generic advanced writing course with a field-specific writing course. The course focuses on both the processes and products of writing and offers strategies for planning, organizing, revising, and editing the kinds of writing that students are likely to encounter in neuroscience. (Refer to Appendix 1.)

As a result of completing this course, students should be able to apply the following skills to writing in neuroscience:

1. Learn genres of writing used in neuroscience.
2. Understand the contexts, purposes, audiences, and processes of written, oral, and visual communication in neuroscience.
3. Recognize and be able to analyze effective and ineffective communication.
4. Learn and use effective face-to-face and electronic strategies for collaborative work.
5. Produce various types of written, oral, and visual communication that are appropriate for and that appeal to various audiences.
6. Balance visual and verbal elements of communication in documents and oral presentations.

Writing tasks include genres unique to neuroscience as well as those that emphasize good communication to a variety of audiences; the tasks include writing a literature review, preparing a poster for a neuroscience conference, applying ethics in neuroscience. (Refer to Appendix 2.) Because the literature review is the most time consuming, it will be discussed in some detail.

**Writing a Literature Review.** The literature review is one step in preparing students to write their own empirical journal article. This is a powerful opportunity for students to have “deliberate practice” in writing the way scholars in their field do (Kellogg and Whiteford, 2009). As students work on their literature reviews, they submit drafts of the paper. I encourage students to submit their review to a neuroscience journal or to any other appropriate scholarly venue that publishes articles on their topic.

For their 10-12 page literature review, students review and evaluate a body of literature by identifying relations, contradictions, gaps, and inconsistencies in the literature and by suggesting the next step needed to solve the research problem. The literature review must be a narrow topic of interest that students would be willing to spend time

researching. The target audience should be the journal that students have identified as suitable for their paper (Tatalovic, 2008); this enables students to shift from “writing for the professor” to “writing for a specific audience” (Prichard, 2005). Using at least 10 of the most representative articles in their review, students give a context for the research question and carefully support assertions with evidence drawn from scholarly sources. After comparing, evaluating, and synthesizing the studies, students must show the implications of the research, rather than merely “summing up.” Students are required to prepare three significantly different drafts of the paper: a rough draft for the instructor so that serious initial problems can be avoided, such as topics that are too broad or papers that are informative instead of persuasive; a second draft to be submitted to peers; and the final version of the paper. It is often in the revision of the assignments that students learn the most about composition.

This assignment has yielded rich papers in the neuroscience discipline with titles such as the following:

- Exercise-induced Neurogenesis: Implications on Brain Size, Learning, Depression, and Old Age in Humans
- Evaluation of Risk Factors for Prescription Opioid Abuse to Create a Risk Stratification test
- The Influence of Dendritic Spines on Long-Term Potentiation, Learning and Memory
- Effective Modes of Learning for Individuals with Angelman Syndrome Based on Genetic Mutations
- Confronting the Mystique of Video Electroencephalography in Diagnosing Psychogenic Nonepileptic Seizures
- Cysteine Modification of SNARE Complex by Reactive Oxygen Species Contribute to Pathogenesis of Neurodegeneration
- Multiple Sclerosis: Iron Deposits and Clinical Effects of the Zamboni Endovascular Procedure

**Preparing Conference Posters.** After students complete their literature review, they prepare and present a mini-poster of their review, often using the same titles. Since the course does not have sufficient time for students to gather their own raw data, students use qualitative or quantitative data excerpted from their literature review research. The completed mini-posters are posted around the classroom for others to critique. This common means of communicating research at conferences can be most appropriately taught and practiced in the classroom setting under the direction of experienced neuroscience faculty.

**Using Ethics in Neuroscience.** One advantage of having a writing course dedicated to neuroscience students is that it provides an opportunity to teach about ethics in this discipline, something that wouldn’t normally happen in a generic English course. The “Writing in Neuroscience” course includes an assignment which requires students to read *Responsible Conduct Regarding Scientific Communication* prepared by the Society for Neuroscience. They then take the tutorials for both the campus Institutional Review Board and the Institutional Animal Care and Use Committee. This assignment is not only for students to

learn about their responsibility when experimenting with animals and humans; it also enables students to think critically about moral dilemmas that may arise in their requests to the Institutional Review Board and Institutional Animal Care and Use Committee and the possible resolutions using the regulations set forth by both.

**Other Relevant Assignments.** Other assignments also help move students into their academic discourse community. For example, students interview neuroscience professionals and summarize what they learned. They also create letters of intent for medical or graduate school applications. Students write abstracts for already published journal articles, then compare their results with the original abstracts (Dickinson, 2009).

## EVALUATION OF THE “WRITING IN NEUROSCIENCE” COURSE EXPERIENCE

The “Writing in Neuroscience” course is a flexible model that can be used by others. To adapt this course, it may be helpful to consider factors in deciding who should teach this course, what kind of support would be helpful, and what can be learned from a formative assessment of the course.

**Who Should Teach this Course?** As an instructor, I realize that although I have taught composition at the university for 19 years, I am not the best teacher for this course because of my lack of neuroscience training. In Fall 2011, neuroscience faculty, the true experts on good writing in their field, should begin teaching this course at BYU. Our neuroscience faculty may not feel prepared to teach writing in their courses, but I can help bridge the transition for faculty being placed in these positions by sharing my curricular design and by moving to the role of faculty support.

Faculty sometimes fear teaching writing because it is time consuming and is not considered in the tenure process. Will this potentially discourage professors from participating? Not necessarily. Recently, I spoke with the (now former) chair of the Neuroscience Department, informing him that I felt that it was time for the neuroscience faculty to take over the course. I recommended some options for replacing me as instructor of the course, including using Ph.D. students from the Neuroscience program or from the Psychology Department. I was surprised by his response. The chair, who has both an M.D. and a Ph.D., wants to teach this class himself! He believes (correctly) that he can come to know his students in ways that he can't know them otherwise. Such benefits combined with the satisfaction of helping students write in the neuroscience discipline may be enough of an incentive to override concerns potential faculty may have.

Neuroscience faculty, who have been immersed in the literature of their discipline, are the logical instructors for this course and for teaching writing in other neuroscience courses. They are both the producers and consumers of good writing in neuroscience and they are the best choice to instruct students how to write well. Good writing is “writing that meets the expectations of faculty in their disciplines...It is not the writing professional who is telling

them what counts as good writing in their fields” (Carter, 2007, p. 408). Having a neuroscience faculty member serve as the instructor could also encourage mentored learning opportunities and could benefit both students and faculty in furthering faculty research projects.

Students would benefit by receiving feedback from neuroscience faculty who can address both the content and the composition of the assignments. Using examples of successful student papers can reduce the number of poor submissions. To cut down on grading time, instructors may choose to use rubrics which can provide a great deal of feedback with less effort. Since commenting on student papers in areas other than content may be a fairly new challenge for neuroscience faculty, this would be an area where faculty would do well to seek time-saving hints from other faculty who teach writing.

**What Kind of Support is Helpful?** At BYU, the College of Family, Home and Social Sciences supports their new writing courses and their instructors through a Writing Lab created just for social science students. Students can bring drafts of their papers to the Social Science Writing Lab to get peer advice on their work. The lab hired a neuroscience student specifically for the purpose of helping students who were taking this course. This student not only served as the primary advisor to meet with neuroscience students who brought their papers to the Writing Lab, but also trained the other advisors in genres and expectations common to neuroscience.

As the College Writing Specialist, I can help faculty who would like to include writing assignments in all neuroscience classes, not just the “Writing in Neuroscience” course. I serve as a resource for faculty who would value help in creating and refining writing prompts and appropriate corresponding grading rubrics. I can also recommend writing tasks that increase the amount of writing students do in a course while not adding undue grading burdens on the faculty. Although my position is unique, this same help may be found in Faculty Centers or Instructional Design Departments.

Other valuable course support could include the neuroscience librarian who assists students with research. BYU's Neuroscience Department also created a student neuroscience journal, *Chiasm*, with an accompanying class for students who run the journal. This offers neuroscience students a local opportunity to publish their papers, though students are not restricted to publishing in this journal.

## What Can be Learned from a Formative Assessment of the Course?

Assessment of the course is ongoing. So far, copies of the students' literature review have been compared to the major papers of students from other university advanced writing courses and assessed blindly by unbiased observers as part of a university writing assessment. Neuroscience students scored as well as or higher than the university mean scores.

Although the course is too new to get in-depth assessment results, student evaluations praise the new course: “It [the “Writing in Neuroscience” course] was a

perfect mix between high demands and realistic expectations.” “This class helped me become a more effective writer and increased my confidence in writing. I found the class difficult, but very rewarding.” “I am glad that I didn't wait until the end of college to take [the 'Writing in Neuroscience' course], because I have learned so many great skills that will help me throughout the rest of college and forever after.” “I am shocked how much this class has helped me grow towards a career. I enjoyed the projects and group work. I especially felt there was an environment where you could make an error, fix it, and continue forward. The class was much more helpful in preparing me for a career and considering other careers because it was geared towards Neuroscience. I believe there should be more encouragement for Neuro students to take this class, because I changed my career plans due to the exposure I got to Neuroscience and technical writing.”

Future assessments of the course could include surveys of neuroscience faculty who have these students in their classes, surveys of students both before and after taking the course to assess students' ability to write in the field, and ongoing university comparisons.

**Is the “Writing in Neuroscience” Course a Good Fit for Others?** The “Writing in Neuroscience” course teaches neuroscience students some of the elements of communicating in their field. It presents opportunities for mentored relationships in small classes and collaborative projects with other neuroscience students. It can also be an innovative solution for meeting learning outcomes that neuroscience students should be able to meet by the time they complete their program and providing a way to measure students' acclimation into their academic discourse.

BYU's Neuroscience program includes a learning outcome that encourages critical thinking, problem solving, and communication skills that can be used throughout a life of learning. “The program prepares students either to enter the workforce competently and competitively, or to further their studies in graduate or professional schools.” Just as the learning outcome describes, neuroscience students need an opportunity to apply, analyze, synthesize, and evaluate information to gain a deep understanding of a research topic (Lynd-Balta, 2006). The “Writing in Neuroscience” course offers the opportunity to do more than just memorize content. A well-written assignment and activity can stimulate critical thinking skills. These same types of activities can be used in other neuroscience courses as well to help students learn neuroscience content through a “write-to-learn” task. Writing should not be limited to a single course, but should be applied in as many neuroscience courses as possible.

This kind of course can be prototyped by neuroscience and composition faculty working in tandem to build solid courses that neither neuroscience nor English teachers could design on their own.

A “Writing in Neuroscience” course can be a good fit for Neuroscience Departments if the factors are carefully weighed. What is the current faculty teaching load? What are the course outcomes? How much writing is currently

taking place in other courses? What communication skills should students have by the time they complete their undergraduate program? What college support is there? This course could be improved and adapted by any Neuroscience Department by being flexible in the course design and by being willing to learn.

## REFERENCES

- Carter M (2007) Ways of knowing, doing, and writing in the disciplines. *College Composition and Communication* 58:385-418.
- Dickinson SD (2009) New(er) kids on the block – voices of junior FUN faculty. *J Undergrad Neurosci Ed* 8:A66-A68.
- Goldbort RC (2001) Scientific writing as an art and as a science. *J Environ Health* 63:22-25. [electronic source downloaded 5 October 2010].
- Holmes JL, Lin A, Fath S, Gray L (1992) The paperless essay: One way to teach writing and computer skills in medical school. *Med Teach* 14:83-88.
- Kellogg RT, Whiteford AP (2009) Training advanced writing skills: The case for deliberate practice. *Educational Psychologist*, 44:250-266.
- Lynd-Balta E (2006) Using literature and innovative assessments to ignite interest and cultivate critical thinking skills in an undergraduate neuroscience course. *CBE Life Sci Educ* 5:167-174.
- Matthews JR, Bowen JM, Matthews RW (2000) Successful scientific writing: A step-by-step guide for the biological and medical sciences. Cambridge, England: Cambridge University Press.
- Peat J, Elliott E, Baur L, Keena V (2002) Scientific writing: easy when you know how. London, England: BMJ Books.
- Prichard JR (2005) Writing to learn: an evaluation of the Calibrated Peer Review™ program in two neuroscience courses. *J Undergrad Neurosci Ed* 4:A34-A39.
- Responsible conduct regarding scientific communication. (1998) Washington D.C.: Society for Neuroscience.
- Tatalovic M (2008) Student science publishing: an exploratory study of undergraduate science research journals and popular science magazines in the US and Europe. *Journal of Science Communication* 7:1-9.

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Address correspondence to: Dr. Joyce Adams, College of Family, Home and Social Sciences, 1049A JFSB, Brigham Young University, Provo, UT 84602 Email: joyce\_adams@byu.edu

## Appendix 1. Curriculum Schedule

Date	Topic	Description
Week 1	Writing in neuroscience Document design Analyzing writing tasks	<p><i>Writing in neuroscience:</i> Students need to be introduced to the writing that takes place in neuroscience; it may be like learning a foreign language to them. This can be introduced by contrasting documents that students may be familiar with, such as a research paper with a humanities topic, and a neuroscience journal article. The instructor could point out such differences as format, tone, vocabulary, genre, &amp; documentation style. Since this will be addressed throughout the course, simple comparisons can be effective in the first week.</p> <p><i>Document design:</i> In addition to tone, etc., students often need to be introduced to the methods of designing documents. If students are already comfortable with designing documents, this instruction may not be necessary.</p> <p><i>Analyzing writing tasks:</i> This instruction benefits both the instructor &amp; students. Instructors can help students understand what is being asked in a writing task, such as understanding the purpose, scope, schedule, &amp; format of a writing response. Assessing the audience can be addressed at this time or in the second week. Time spent helping students understand how to respond to requests for writing at the beginning of the semester can save many hours for both students and instructors.</p>
Week 2	Reading technical articles Interviewing neuroscience professionals Audience analysis	<p><i>Reading technical articles:</i> Students are often unfamiliar with technical articles and may need guidance in how to read and understand them. For example, students may not know the value of an abstract or the format for a scientific experiment paper (Introduction, Methods, Results, and Discussion).</p> <p><i>Interviewing neuroscience professionals:</i> This assignment enables students to talk to a professor or professional in their own discipline. Topics could include advice the interviewee has for the student to more successfully prepare for further education or employment.</p> <p><i>Audience analysis:</i> Students benefit from a discussion of audiences for their writing and for the scholarly material they read. This could include the type of vocabulary to use, expected formats, the need for concise writing, etc.</p>
Week 3	Job application Resumes Letters of intent Grad school & employment interviews	<p><i>Writing to get a job or to get into graduate school:</i> The topics for this week enable the instructor to guide students into the types of writing necessary to further their career and educational plans. It also enables the instructor to share the kinds of skills and experiences that will be necessary to succeed in this discipline. Learning to write a resume helps students recognize the educational preparation they will need to successfully compete both for graduate school admission &amp; the workplace.</p>
Week 4	Literature reviews Choosing a topic	<p><i>Literature Reviews:</i> Students need to see examples of literature reviews and to understand the purpose of them. Instructors can help students see that this is not simply a writing task, but a genre that is used frequently in this discipline.</p> <p><i>Choosing a topic:</i> In spite of good instruction about writing tasks, choosing a topic is often daunting for students. They need guidance in selecting appropriate topics and in narrowing the focus. They are usually afraid they won't have enough to say, so they select topics that are far too broad.</p>
Week 5	Research methods Textual analysis (evaluating sources) Introduction, Methods, Results, & Discussions (IMRAD) Library mini-class	<p><i>Research methods:</i> Students need to have tools to search for scholarly sources that will support their claims. Instructors can teach this themselves or invite the neuroscience librarian to do so.</p> <p><i>Library research:</i> It may be a wise use of class time to take the entire class to meet with the neuroscience librarian, who could instruct students on what sources are available, and where to find them.</p> <p><i>Textual analysis:</i> Instructors should teach students how to analyze prospective sources for their literature reviews. This would include helping students find scholarly sources &amp; eliminate inappropriate sources.</p> <p><i>IMRAD:</i> Students may not understand the purpose of each section of a scientific experimental paper. They need instruction and examples of good and poor articles that use this structure.</p>
Week 6	Synthesizing literature Summarizing & paraphrasing	<p><i>Synthesizing literature:</i> This skill seems to be one that students struggle with. This week can be spent helping students master the skills of summarizing &amp; paraphrasing &amp; then synthesizing what they have learned to support their own ideas &amp; claims. These skills are best taught to students using examples &amp; providing opportunities in class for students to practice.</p>

Date	Topic	Description
Week 7	IRB/ IACUC Outline of draft Appropriate documentation style	<i>IRB/IACUC:</i> Students need to clearly understand their responsibility to get institutional approval for their projects. They can take tutorials to help them get an overview of the review process for both organizations. <i>Outline of draft:</i> Students can use instruction and practice in creating outlines of their literature review to help them see the whole picture of their paper & to make necessary revisions. <i>Documentation style:</i> As research for the literature reviews escalates, it will help students to be familiar with the documentation that is assigned for their literature reviews (e.g., APA or AMA).
Week 8	Memos Tables & graphics Punctuation & mechanics	<i>Memos:</i> A major complaint in industry is that college students do not know how to write appropriate memos. Memos can be taught and then required to update the instructor on the progress of students' literature reviews. <i>Tables &amp; graphics:</i> Students need to see good and poor examples of graphics used in neuroscience articles and then have an opportunity to create their own under instructor guidance. <i>Punctuation &amp; mechanics:</i> Although mechanics may be less important than the organization and presentation of the content, students should understand that when poorly done, these elements distract from valuable messages.
Week 9	Style concerns – Clarity, Jargon, Logic & Argument	<i>Style:</i> This instruction can include any areas where the instructor senses weakness in students' writing. In particular, clarity, jargon, logic, and argument are good choices. Students will benefit from good and poor examples of this type of writing and from in-class opportunities to learn and practice these skills. Students can also teach these principles as a collaborative group or individually to the whole class.
Week 10	Coherence Abstract & title	<i>Coherence:</i> Instructors can use part of this week to meet individually with students to review the coherence of student papers. Is there an overarching thesis? Have students provided evidence to support their claims? <i>Abstract &amp; title:</i> By this point in the semester, students should have developed significant drafts of their literature reviews and are prepared to learn about the importance of the abstract and title of their work. Instructors can provide good and poor examples and in-class opportunities for students to practice writing their own.
Week 11	Cultural sensitivity Ethics	<i>Cultural sensitivity:</i> Students need to be taught about the cultural sensitivity required in writing in neuroscience. Good and poor examples are particularly helpful with opportunities to practice. <i>Ethics:</i> This is a good opportunity to introduce students to "Responsible Conduct Regarding Scientific Communication" published by the Society for Neuroscience. It is helpful to create in-class activities for referencing the document & enabling students to see the scope of its contents.
Week 12	Revision & editing Style & mechanics	<i>Revision &amp; editing:</i> Students should have a complete draft of the paper completed by now. Use this week to teach students elements of revising & editing and offer in-class opportunities to practice these skills.
Week 13	Oral presentations Posters Posters workshop Peer reviews	<i>Oral presentations &amp; posters:</i> Since these are important elements of communicating in neuroscience, it is a good idea to teach the principles of good presentations. Examples of posters combined with instruction will help students to create their own. <i>Peer reviews:</i> Students are often surprised to learn that professors and professionals have peers review their work. Teach students appropriate methods for reviewing the work of their peers.
Week 14	Oral presentations	<i>Oral presentations:</i> The last days of the semester are profitably spent in hearing students orally present the information condensed from their literature reviews. This can be accompanied by student posters and PowerPoint presentations.
Week 15	Oral presentations Review for final exam	

*Appendix 2: Course Assignments with Recommended Grading Criteria and Feedback.* Note: For most of the assignments, the use of a rubric will encourage reliable scoring and will give students many insights, yet not increase grading time for instructors.

<b>Assignments</b>	<b>Grading Criteria</b>	<b>Feedback</b>
Resume	Use a rubric that includes criteria such as “Is the first item under the contact information the experience or skill that is most valuable and appealing to the future employer?”	Rigorous, insightful feedback will help students prepare more appropriate career documents.
Letter of Intent for Graduate School	Use a rubric that includes criteria such as “Does the essay draw the reader in at the very beginning?”	
Response Papers and Quizzes that enable students to get a richer experience from required readings	In-depth interaction with readings Minimum length	Don’t waste time requiring grammar and mechanical correctness. Consider this a “conversation” with the student.
Preliminary Topic Focus	Indicates that the topic is relevant, narrow, and of deep interest to the student	Helping students focus on a narrow topic early in the semester will save time for both faculty and students.
References list of sources for Literature Review, correctly formatted	1. Minimum number of sources (e.g., 10) 2. Correct documentation style 3. Sources are scholarly & varied	Help students master the use of documentation style manual at this stage. Make certain students are using scholarly sources.
Source Analysis	Consider using a form that students merely complete (e.g., Who is the author? Reputable? Who are the publishers? . . .)	Do not make extensive comments or worry about format & mechanical correctness. Simply verify that student understands how to find scholarly sources.
Research Memo	1. Addresses all required requests (e.g., what sources are most useful for your paper? What concerns do you have with the paper? Do you have a draft with a minimum of X pages? What is next?) 2. Minimum length and depth	Help students eliminate problems at this stage. Comment on strengths & weaknesses of the content. Don’t worry too much about format or mechanical correctness.
Outline of Draft	1. Meets criteria for depth & length 2. Each section supports thesis 3. Clearly articulates the paper’s argument 4. Illustrates that the topic is sufficiently narrow	Help students eliminate problems at this stage. Comment on strengths & weaknesses of the content of the outline. Don’t worry too much about format or mechanical correctness.
Final Literature Review	A rubric given to students before submitting the paper is crucial. It should include criteria such as “Does the paper demonstrate familiarity with the most appropriate published research on the topic?”	Although format & mechanical correctness should be required, after the third error, simply instruct the student to correct all other errors in the paper and deduct the appropriate points. For excessive errors, refuse to grade paper until the errors have been corrected.
Oral Presentation of Literature Review	1. Professional delivery 2. Clear plan of development 3. Adapted to audience 4. Skillful use of visual aids	Encourage students to avoid using notes. PowerPoint presentations would be appropriate.
Poster based on Literature Review	1. Self-explanatory with document design 2. Reviews past research 3. Introduction succinctly presents issue 4. Informative discussion	Provide examples of scholarly posters. Student posters could be smaller scale due to cost of printing large ones. Offer thoughtful comments to guide students.
Interview Professor or Professional who could offer insights into student’s potential career	1. Minimum required length 2. Reflection on the value of the interview	Don’t worry about format or mechanical correctness. A simple comment at the end is sufficient.

Assignments	Grading Criteria	Feedback
IRB/IACUC reading and tutorials	Tutorials have been completed & certificate has been attached	Don't worry about format or mechanical correctness if you require a response to these readings.
Graphic or table	<ol style="list-style-type: none"> <li>1. Meets documentation style requirements</li> <li>2. Illustrates an important point from Literature Review</li> <li>3. Adheres to common graphic rules</li> </ol>	A simple reading of the graphic is sufficient. Is it appropriate for the topic? Is it labeled correctly? Would it be appropriate for scholarly journals?
Summary/Paraphrase/Synthesis	<ol style="list-style-type: none"> <li>1. Demonstrates mastery of all 3 skills</li> <li>2. Uses correct documentation style to label</li> </ol>	For the first read, students can exchange papers and evaluate peer's success. Instructor can then simply make additional comments.
Peer Critique of Literature Review	<ol style="list-style-type: none"> <li>1. Specific and well supported analysis</li> <li>2. Focused on global issues rather than editorial</li> <li>3. Appropriate tone</li> </ol>	This paper can be required before paper is due and after instructor corrects errors of advice. The review can be used by original student to revise before submitting to instructor. Or the peer review can be submitted after the literature review has been graded and NOT returned to either student, thus eliminating the need for rigorous comments by the instructor. (It can be considered part of final exam)
Final Exam which includes students' reflections on their writing	Reflections should be specific and could include what the student would do to revise the paper after seeing the instructor's comments	Don't correct format or mechanics. Simply look for thoughtful, appropriate responses. Give a holistic score.