Report on use of UCSC DCG Funds, BME 185

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This is the mandated report for the grant *New technical writing course for biomolecular engineers*, which has helped fund the creation of the Disciplinary Communications course BME 185, Technical Writing for Biomolecular Engineers.

The grant request was for $14,000 ($7,000/year for 2 years), but funding is only offered in one-year increments, so $7,000 was granted. The proposal called for the creation and refinement of a new course, BME 185, Technical Writing for Biomolecular Engineers, with a focus on topics, issues, and communication methods relevant to biomolecular engineering. The funding was used to pay part of the salary for Joy Hagen's Winter 2016 offering of the course.

The initial course design was simultaneous with the grant proposal and BME 185 has now been taught twice: Spring 2015 (20 students) and Winter 2016 (21 students). It is currently being taught (Summer 2016) to 17 students, and is scheduled again for Winter 2017 (limited to 20 students). Each offering of the course is with Joy Hagen as the instructor. The intent is to offer the course twice a year (Winter and Summer), perhaps increasing to three times a year if funding can be found for the writing instructor.

The class size is limited to 20 students, in order to provide sufficient feedback to the students on their writing. Increases in capacity, if needed, will be achieved by offering the course in more quarters, rather than by increasing the class size or hiring teaching assistants. Not only do professional writing instructors provide better feedback and instruction for the students than TAs, they actually cost the department less.

1 Meetings of Tech Writing Instructors

In 2015–16, Kevin Karplus organized two meetings of the faculty who teach writing to engineering students (Monday 2015 Nov 23 and Friday 2016 May 6). One outcome of these meetings was the creation of a mailing list, tech-writing-teachers@soe.ucsc.edu and a Google Drive directory for sharing information.

The mailing list now has 11 faculty members (including one who could not attend either meeting), all of whom teach or evaluate writing in one or more Baskin School of Engineering (BSoE) courses. The mailing list has not been very active—only 10 messages so far, most either about scheduling meetings or brief followups after meetings.

The Google Drive has files provided by Kevin Karplus and by Joy Hagen:

- assignments, readings, course schedules, and revision notes for BME 185;
- a PDF of the design-report chapter from *Applied Electronics for Bioengineers*, and examples of student design reports (one B+, one B–) from BME 101 to share with Writing 2 instructors; and
- sample of student work for the BME 205 fellowship application assignment.

The November meeting had eight attendees: 3 ladder-rank faculty faculty from BME, Kevin Karplus, Camilla Forsberg, and Phil Berman; 4 writing instructors, Terry Terhaar, Gerald Moulds,

Joy Hagen, and Patrick McKercher; and 1 staff person who teaches writing to minority students, Zia Isola. Notes from the meeting were posted on Karplus's blog: `https://gasstationwithoutpumps.wordpress.com/2015/11/23/meeting-for-teachers-of-writing-to-engineers/`.

No notes were taken at the May meeting, but discussion included better articulation of the Writing 2 courses with the upper-division writing courses in BSoE.

BME 185 has become more articulated with Writing 2 and with the further DC requirements in BME (the senior thesis course or the capstone course). The articulation has been thanks to our meetings and to Terry Terhaar's service as the senior thesis instructor (BME 123T), as well as some feedback from students moving from BME 185 to BME 123T course. The informal teaching circle allowed for communication between instructors about the assignments and the preparation of the students.

On the WRIT 2 side, the library assessment and instruction builds on the learning outcomes for inquiry and research writing of C2-satisfying students. The style work pushes students into a more efficient style and correspondingly deeper sentence-level attention than is likely in the composition-centric WRIT 2 courses. Both of these areas are ones where disciplinary-specific expectations for BME students likely diverge from students in other disciplines and so are ideally handled within the context of the major. (For example, research on patents, grants, protocols, data, genes, etc. and writing for concision and clarity in report genres.)

On the DC side lies an expectation for a writing process that involves regular progress reports, lab notebooks, development of protocols, and construction of figures as well as the construction of academic research papers. The attention to revising the course so far has centered on meeting the students' needs with instruction that gives them tools for success in these genres of scientific writing practice and report writing in engineering. Continued communication will be important for maintaining articulation as courses and instructors shift (perhaps a more formal teaching circle or ongoing feedback from exiting students).

2 Program Learning Outcomes

We have examined how BME 185 meets the Program Learning Outcomes (PLOs) for the Bioengineering BS program:

A bioengineering student completing the program should

have a broad knowledge of science and engineering disciplines including biology, chemistry, physics, mathematics, statistics, and computer science; Students deepen their knowledge through composing and revising to communicate detailed knowledge in technical writing formats (technical reports, protocols, posters). Through critiquing and developing graphics, students practice graphical display of statistical data, including choosing appropriate chart formats for their data.

be able to apply their broad knowledge to identify, formulate, and solve engineering design problems; Although BME 185 does not directly address this PLO, most of the writing tasks are aimed at helping students formulate their design problems clearly—writing clearly is an essential aid to thinking clearly.

be able to find and use information from a variety of sources, including books, journal articles, online encyclopedias, and manufacturer data sheets; Students perform several library research tasks and take a two-hour library class (one hour taught by subject librarian). Students begin a Zotero bibliographic library and are introduced to searching

beyond the scholarly journal article literature, including searching for patents, grants, genes, and protocols. Students present on various research tools.

be able to design and conduct experiments, as well as to analyze and interpret data; Students practice graphical display of statistical data, including choosing appropriate chart formats for their data and creating/revising figures and charts using raw data. Students learn and practice using MatLab to develop publication quality graphics. Some students write in-code documentation for part of their final technical report.

be able to communicate problems, experiments, and design solutions in writing, orally, and as posters; Students report on document design, write detailed protocols, and critique and develop graphics. In addition to creating graphics, technical reports, protocols, posters, and technical reports, students present orally three times (library skills, graphics, and final project or poster). Students also communicate progress over email and collaborate in groups.

be able to apply ethical reasoning to make decisions about engineering methods and solutions in a global, economic, environmental, and societal context. Students review the IEEE ethics statements and carry out detailed analysis of concepts of plagiarism, re-use, and intellectual property. Students develop deeper knowledge of proper citation and attribution in all writing genres (reports, protocols, posters, graphics, etc.) and then are held absolutely to those expectations in their final portfolio assignments.

Joy Hagen has prepared a draft course checklist that outlines the learning goals associated with each assignment and is currently revising this for use at the end of summer session. The goals or learning outcomes are put at the top of each assignment handout, so the learning goals are part of the assignment prompt documents.

Students do an informal reflection (attached) at the end of class that speaks to the learning goals, too.

3 Pedagogical Challenges

The most important challenges have been meeting the interdisciplinary needs of students, where real writing occasions differ a good deal between specializations and audiences, and providing good, updated model texts for such an interdisciplinary program. The best models to be found in business writing texts/engineering texts/biomedical texts each exclude some students' expectations. Joy is currently scanning individual chapters from several different texts so that there are a variety of annotated models of each genre assigned. Joy will be having students reading and critiquing technical reports early on in the quarter to meet standards for their final report.

Attached is a partially-completed annotated bibliography of text books suitable for use in the course. The course currently uses PDFs of single chapters from a variety of texts and lots of different models from texts. More work is planned in collecting and evaluating outside resources and materials.

The students as a group have generally weak skills in analyzing the models and adapting them to suit their individual projects. BME 185 has added more in-class document analysis and discussion time for critiquing models to give the students this skill in document design and skills for varying their strategies in report writing in different situations. Eventually, there will be adequate "good" models from students themselves, but so far there are only nominal examples.

Another challenging area has been the current research and experience range of students, especially in the library research and graphic design areas. These each have received broadened class time and more scaffolded assignments as a result. The library assignment is really "guided research practice" instead of a library puzzle and further attention to acknowledging sources has been added.

Librarian Christy Hightower has modified and implemented a well-suited library class, and Joy assesses each class, then determines how much instructional time to devote to library research skills like database search practice and other fundamentals. Joy has created a library worksheet that ties the instructional time for the librarian to the course assignments, and an assessment form, which is a series of tasks, like a puzzle, that assesses each student's library competence. The library worksheet and the library assessment form are attached to this report.

4 Curricular Revisions

The scope and number of assignments are the same as in the initial course design, but the assignment prompts will all be revised for the coming year. Attached to this report is the assignment list, which shows updates to the scaffolding of steps, attention to writing process, peer review assignments, and required revision. The reflection on what is working (and not) has been done, but the assignment handouts themselves still need to be updated to reflect current practice—discussion time in class is used to help refine the assignments, so the handouts will never be completely up to date.

More detail and perhaps different expectations have been added to the proposal and progress report assignments, which now include a lot of instruction in document design and some analytic practice assessing what makes documents successful.

Joy has considered adding a lab notebook assignment or a regular weekly writing load, such as weekly progress reports, but is focusing on making the current assignments more effective before deciding whether the student and instructor workload can handle additional assignments and whether some original assignments should be replaced.

Next year, the technical report will be more highly scaffolded and perhaps broken up into two separate assignments to solve the end-of-quarter feedback/revision time-line problem. Ideally, students would have adequate time to write and critique their own reports, but they have so far struggled to meet even the current week 8–9 deadlines for final reports, and so the students will be more closely guided and trained to meet the expected standards.

Careful peer review has been developed for the job application materials (attached), protocols (attached), presentations, and graphics critiques. Group and individual conferences have also been added and will depend on the way the technical report assignment is scheduled. Materials to guide in-class group work seem necessary to engage the students more in the practice of writing, so more materials are forthcoming. Joy used workbook exercises on concise writing as a warm-up handout and the structure provided by that resource made it especially well received, even though there was better practice to be found in peer review of "live" documents. Highly structured in-class tasks and detailed instructions to accompany them still need to be developed for many of the course units to make in-class instructional time more productive, engaging, and active. Summer session is helping with this because of the long class periods which demand adapting, through more active learning practices, to keep the class engaged in learning for extended durations.

5 Attachments

- BME reflection prompt.pdf
- BME185Assignment_List_Summer_2016.pdf

- Library Unit Assessment2.pdf
- Library_WorksheetBME185.pdf
- Peer review for job application cover letter and resumes.pdf
- Protocol+Peer+Review.pdf
- Resources.docx

Note: Your portfolio work is graded holistically and the reflection is read last. Reflections can only influence your grade positively, never negatively. If your reflection fills in a gap where some knowledge, learning, or work are otherwise invisible in the portfolio, then the reflection can work in your favor during grading. Otherwise, it serves your own learning purposes and helps with course assessment.

When learning by doing, post-analysis and reflection are necessary for solidifying practiced skills and knowledge, allowing you to more readily mobilize those skills on future occasions. Point to your learning and identify some of the knowledge you gained. Add your reflection to your portfolio or upload it into the assignment file.

Reflect on the following with specific reference to your portfolio assignments. There are no "right" responses.

1. What **genres** are in your portfolio?
2. Reflect on **audience assessment**.
3. Reflect on **prioritizing information** and on **organization/structure**.
4. Reflect on **library research** skills and on **citation** in your major/discipline.
5. Reflect on **concise writing** and on **active, direct prose**.
6. Reflect on standards for creating and designing quality **graphics**.
7. Reflect on **document specification** in engineering (and/or on **Technical Reports**).

Assignment	Due	
1. JOB APPLICATION MATERIALS		
1.1 Job application cover letter	Draft Th 6/23	Final T 6/28
1.2 Resumes (general and tailored)	Draft Th 6/23	Final T 6/28
1.3 (Not assigned) Supervisor letter of referral (letter of recommendation)	Written in class	
2. LIBRARY SKILLS		
2.1 Library assessment	6/28 T	
2.2 Library resource presentations	TBD	
2.3 Library exploration worksheet/ notes	7/7 Th	
3. FINAL PROJECT PROPOSAL		
3.1 Document design	6/30 Th	
3.2 Proposal draft	7/5 T	
3.3 Combined final proposal		7/7 Th
4. SCIENTIFIC GRAPHICS		
4.1 Present graphic to critique	6/30 Th	
4.2 Three graphics	7/7 Th	See report
4.3 Present your own graphic	7/7 Th	
5. LAB PROTOCOL		
5.1 Draft	7/12 T	
5.2 Protocol peer review	7/12 T	
5.3 Revised final draft	TBA	
6. ORAL PRESENTATION	various	Two ea.
7. PROGRESS REPORT		
7.1 First report	7/5 T	
7.2 Second report	7/12 T	
8. POSTER	7/19 T	
9. TECHNICAL REPORT		
9.1 Draft	7/14 Th	
9.2 Report Peer review	7/14 Th	
9.3 Revised final draft	7/19 T	

Notes:

- See Course Schedule for dates assignments are introduced, schedule of readings, and scheduled in-class work.
- Schedule is subject to change, but due dates will not be advanced (though they may be postponed).

Edit this form

Library Unit Assessment

Please respond QUICKLY to the tasks below. The point is to provide an honest snapshot of your ease/difficulty with some of the library tools. Your starting skills do not affect your class performance at all, but can be used to tailor instruction within our small class. Make sure to respond fully to the final self-reflection, sharing your observations of any difficulties and further work you would like to focus on or resources you would like help with.

* Required

Using Cruzcat, find one edited book of protocols and/or methods related to an area you study, specialize in, or are interested in. In the space given, paste: 1) title, 2) editor(s) name(s), 3) call# or active URL link if it's an online source. *

If you were unhappy with your options for the previous question, how could you widen your search? *

Answer even if your results for the previous search were satisfactory.

To physically browse technical writing handbooks, where would you go (what floor of which library)? How do you know? *

Using the Web of Science database, search for the most recent publication of a researcher whose work you are familiar with. Type the correctly formatted reference listing here. *

Remember you are doing this task QUICKLY; you do not need to check your format's details although you are expected to try to use the correct and complete format.

What type of source is the publication you just listed? *

- ◯ Article
- ◯ Review
- ◯ Book Chapter
- ◯ Proceedings or meeting abstract
- ◯ Other

For the same author/researcher, find their oldest paper and provide the correctly formatted citation. *

For the citation above, what citation format did you use? *

- ◯ APA
- ◯ CSE/CBE
- ◯ IEEE
- ◯ MLA
- ◯ Don't Know
- ◯ Other:

Were any of the above tasks easy? Which one(s)? Why-- what did you do that quickly responded to the task's demands? *

What tools within Web of Science did you use to accomplish these tasks? *

Name specific database options, please.

Which of the above tasks gave you difficulty? Name any specific obstacles with some detail. *

Reflection: Please communicate any concerns or questions about library research and sources, whether they are general questions or are prompted by the tasks above. *

What areas should we spend our library unit time on?

Submit

100%: You made it.

Never submit passwords through Google Forms.

Library Class, BME185

Bring your own Internet-capable device

Guest Instructor: Science librarian Christy Hightower

LIBRARY WORKSHEET: Fill this out and turn it in during the next class.

Your name:_____

ASSIGNMENT 2. LIBRARY UNIT

- At the beginning of the class, did you already have a Zotero account? (Circle one)

  Y / N

- If you use a different software for building bibliographies, what is it?

- At the end of class, do you have any references in Zotero? Y / N
  - If yes, how many?

- Make note of at least two new things you learned and how they will help your work as a scholar and researcher:

ASSIGNMENT 3. PROPOSING YOUR FINAL PROJECT

For your final project, you will be writing a formal proposal, reporting on an investigation, or doing a library research project. Regardless of the format, your proposal must have **at least four references** to academic sources and your final project will have a minimum of around six.

- What subjects are you considering for your research and final project?

- List at least six keywords here (feel free to begin building a keyword tree).

- List at least three useful search strings.

- What library tools or databases have you tried?

- Are there others you might try? List some here.

ASSIGNMENT 4. FIGURES, TABLES, AND OTHER GRAPHICS

WHAT TO DO: Find a figure, table, or other graphic from a peer-reviewed journal article. You should find and skim a variety of papers in search of graphics that you find useful and excellent, or disgracefully lacking/confusing. We will then critique them together in class during a brief presentation by you. (*Respond below even if you already located a graphic to critique.)*

- What keywords and search strings did you use to search sources?

- Which databases or other tools did you use to search?

- Give the citation information for your graphic (or indicate you will add this to your presentation of the graphic).

4. CON'T. DATA FOR YOUR GRAPHICS

WHAT TO DO: Find data (preferably related to your final project) to explore and to use to create your own figures and other graphs. *Respond below even if you already have data.*

- Discuss a couple (at least two) different ways to locate sources of data you could use for this assignment.

- What kind (or kinds) of data sets will they be? (In other words, what types of measurements and results are represented by the raw data?

- If you found one or more leads on data, note what they are:

Peer review and revision instructions: Job application cover letter and resumes (1.1 & 1.2)

1. Form a peer review group with two other classmates (group of 3).
2. Verbally and in margin comments, discuss/comment on each other's ***format*** and ***content***.
    a. Format
        - ☐ For the resumes: What works, visually, on the page. Compare formats and discuss what helps make the information clear and appealing vs. what appears distracting or dense.
        - ☐ For the letters: Are they in correct business letter format? Determine what the correct conventions are and whether your group's draft letters meet those expectations successfully.

    b. Content
        - ☐ For the resumes: What categories and organization are used? Are these effective? Is the style active, clear, and concise? Compare and discuss resume content.
        - ☐ For the letters: Do they pass the "30-second rule"? Is the most important information first? Do they tell a story that complements, but doesn't repeat, the information in the resume? Is the style active, clear, and concise?
        - ☐ Revise sentences from the letters for active and concise style. Take one sentence from each of your group-mate's papers and revise it for clear, direct actors and actions. Make positive changes that improve concision. (Each group member will be re-writing two sentences total for practice.)
3. Revise your materials:
    a. Job application letter checklist:
        - ☐ The audience is specific and the first sentence speaks to their needs.
        - ☐ The most important information is first.
        - ☐ The style is active, direct, and concise.
        - ☐ The letter tells a story of shared values and your desirability for the position.
        - ☐ The narrative in the letter adds value to the resume and does not repeat much, if any, information from the resume.
        - ☐ The letter formatting is correct and complete.

    b. Resume checklist (Note: both the general, catch-all master resume and the resume built for the specific job announcement must be revised.):
        - ☐ The design is appealing and clear, without being distracting.
        - ☐ The organization and categories assist in the understanding of information.
        - ☐ The written style is concise without being vague.
        - ☐ The information is tailored to the specific job announcement (or potential announcements for the general resume), including its sequence, the organization, and the details.
        - ☐ The tailored resume fits on one page.
4. What to turn in: Hard-copies **DUE**_____
    1.1 Newest revision, peer comments, original draft
    1.2 For both resumes: Newest revisions, peer comments, original drafts
    Other: Notes and original job posting/ announcement.
    *Don't forget to staple or use a binder clip.
    Note: Summer session will not include 1.3 Referral/reference letter.

BME185 Hagen 2015

Take one sheet per person

PROTOCOL PEER REVIEW

These instructions are in three parts. First, the steps and process are described from beginning to end. Second, the *mirroring* step is described and explained. Third, the written feedback step is given as a brief worksheet.

Instructions:

1. Form a group of four (you plus three other students in the class).*
2. Break your group into two pairs.
3. In pairs:
   a. Each person will read their protocol out loud to their partner. While they are reading out loud, their partner will listen (not read) and "mirror" their understanding of the protocol and its instructions. See below for *Mirroring* instructions.
   b. During the mirroring step, both the writer and the listener/audience will silently note any confusion or misunderstanding. Go slow!
   c. When the first person in the pair is finished reading their entire protocol out loud, they will give the written version to their partner who will read it and note any differences in understanding between hearing the protocol instructions and seeing/ reading the protocol.
   d. Analysis step: Spend five minutes comparing notes and looking for opportunities for clarification of the protocol as it is written.
   e. Repeat steps 3a through 3d for the other person in the pair.
4. Switch partners with someone else in your group to form a new pair.
5. Repeat step 3.
6. If your pair finishes step 5 before the other pair in your group, observe their mirroring and analysis steps until they finish.
7. Together with your entire group, go over each individual's protocol. You will only have read two of the three other protocols within your group, but you should still participate fully in this final part of the peer review.
   For each protocol:
   a. Designate one note-taker who will synthesize all of the comments and feedback onto one worksheet for the author. The author and the note-taker cannot be the same person.
   b. As a group, discuss and record responses as prompted on the worksheet.
   c. Make sure all group members' names are on the worksheet and give the worksheet to the author.
   d. Repeat 7a-7c for all group members.

Mirroring

- Mirroring is an activity that reflects a person's communication back at himself or herself. It involves a listener repeating almost exactly what the speaker means.
- Mirroring should be short and simple. It is usually enough for the listener to just repeat key words or paraphrase the last few words spoken. This shows you are trying to understand the speaker's terms of reference and acts as a prompt for them to continue.
- Be aware not to over mirror as this can become irritating and therefore a distraction from the message, but don't be too vague or general either. The speaker should have a good idea of how the listener understood what they meant to communicate, including relevant/ important details.
- In our mirroring, you will mostly be paraphrasing. Paraphrasing involves using other words to reflect what the speaker has said. Paraphrasing shows not only that you are listening, but that you are attempting to understand what the speaker is saying.
- It is often the case that people 'hear what they expect to hear' due to their own prior knowledge, assumptions, stereotyping, or prejudices. When paraphrasing, it is of utmost importance that you do not introduce your own ideas or question the speaker's thoughts, feelings or actions.

*If you cannot form an even group, use a group of three and modify the protocol to include one pair and one observer in the mirroring step.

- Your responses should be non-directive and non-judgmental. In other words, don't speak back or elaborate, clarify, etc.
- It is very difficult to resist the temptation to ask questions when this technique is first used; reflecting can seem very stilted and unnatural. That's actually OK, you need to practice this skill in order to feel comfortable.
- When mirroring for instructions or protocols, the speaker should pause after each discrete step to wait for the paraphrase from their partner. If something is long and complex, choose an appropriate place to pause so that you don't have to re-read/ repeat too much. As a rule of thumb, four sentences should be your maximum between pausing for a mirrored response.

Find more at: http://www.skillsyouneed.com/ips/reflecting.html#ixzz3HaQ3wl00

Worksheet (use separate sheet of paper if needed for more extensive notes)

Group (names)_____

Writer/Author name_____

1. Summarize any misunderstandings or needed clarifications in the protocol.

2. Summarize any redundancies or over-explained/ over-written portions of the protocol.

3. In general, is the protocol:
    a. Thin—hard to understand because of missing steps, ambiguous/ general/ vague language, or poor detail/clarity
    b. Robust—clear and easy to understand
    c. Over-decorated—too complex or repetitive to easily follow

   What are some exceptions to this generalization of the protocol?

4. Are there opportunities to edit for active and concise language at the sentence level?

5. Who is the audience? How might you alter this protocol for a different audience?

6. Other comments:

Alred, Gerald J., Charles T. Brusaw, and Walter E. Oliu. (2015). Handbook of Technical Writing, 11e. Bedford St. Martin's.

Notes: While this book's content in well-aimed for the needs of the class and it contains many good, annotated models that are instructive, the entries are ordered alphabetically like an index. Such an ordering makes it difficult for a student to access the contect. For example, to see the conventions for formatting equations, you can't alphabetically go to the "E"s, because the entry is under "Mathematical Equations". So, while teaching from this book could be an option ($60), it's not practical as an additional reference text. The instructor would have to be committed to teaching it.

Block, S.M. 1996. Do's and dont's of poster presentations. *Biophysical Journal* 71:3527-3529.

Gurak, Laura J. and John K. Lannon. Strategies for technical communication in the workplace. Pearson Longman.

Notes: This text is closest to one we might use in a 10 week course. Although it speaks to generic workplace tech writing, it includes good models that are annotated and applicable to bioengineering careers. The text finds a good balance between business writing matters and common communication problems for engineers. The 2010 edition is slightly out of date and so is economical ($20), although enough copies may not sustainably be obtained. The newest edition is price prohibitive for a 10 week course ($90), although an ebook option may exist.

Ch. 9 *Resumes and other employment materials.* Contains good models and up to date advice about electronic submissions.

Huckin, T. N. & Olsen, L. A. (1991). Technical writing and professional communication: For nonnative speakers of English. New York: McGraw-Hill.

Notes: Dated, but still a useful text and other texts are, oddly, comparatively off-center for our needs. Particularly useful chapters include:

- Ch. 3. *Identifying audiences and purposes.* In addition to detailed audience analysis and definition of purpose, this chapter includes short report formats/ models, both informal and formal.
- Ch. 10. *Resumes and Job Letters.* Solid instructions, although somewhat dated. Lots of models/examples. More useful as supplemental or optional for the variety of model texts.
- Ch. 16. *The Proposal.* Moels are specific to engineering and include both formal and short, informal proposals.

Kowalski, Dawn. (1994 - 2012). Engineering Technical Reports. Writing@CSU. Colorado State University. Available at http://writing.colostate.edu/guides/guide.cfm?guideid=88.

Notes: This model text is from a physical engineering perspective and gives very good yet brief descriptions of the expectations of a technical report. The particular value of this resource is the instructor's annotations and responses; they keep it real (but it isn't pretty).

Lunsford, Andrea. (2009). Everyday Writer, 4e. Bedford, St. Martin.

Notes: All around handbook widely used on campus. The text is on its 6th edition and so the 4th and 5th editions are widely available for very low prices. Includes college writing processes, conventions, and formats. Contains Council of Science Editors citation format, help for multilingual students, etc.

Mathews, Diane L. (1990). The Scientific Poster: Guidelines for effective visual communication. *Technical Communication.* 37 (3). 225-232.

Notes: While a bit dated, this paper gives excellent instructions, advice, and guidelines.

Ramsey, Jon. (2016) Business Writing Scenarios: Writing from the inside. Bedford St. Martin's.

Notes: Very good text for the specifics of business writing. The chapter on resumes and job materials is currently assigned reading.

Zeiger, Mimi. (2000). Essentials of writing biomedical research papers, 2e. McGraw Hill.

Notes: This valuable and highly acclaimed text has good disciplinary specificity and excellent writing instruction. While its scope is limited to academic research paper publication in biomedical disciplines and its audience is more correctly graduate students, it still offers a lot for this course, including:

- The preface, which describes "clear writing" and the paper structure/ development/ organization of the IMRaD format.
- Ch. 8. *Figures and Tables.* As an assigned reading, this chapter clearly lays out the conventions and expectations of figures and tables; these are shared with BME documents across genres.
- Ch. 9. *Referencing Sources.* Lays out the conventions and expectations of citation; shared with BME documents across genres.

And others…
Donnell et al. Writing Style and Standards in Undergraduate reports…

Writing in clinical chem…