Supplemental Material

CBE—Life Sciences Education

Wrighting *et al.*

Supplemental Material Legends

Supplemental Figure 1. Course components and self-reported learning. The course featured three main areas of focus that were presented as pillars supporting advancement in STEM careers. A word cloud represents student-reported learning, with the size of the words corresponding to the frequency they were mentioned by students.

Supplemental Figure 2. Course Syllabus, Spring 2017. The course syllabus provides the logistical information and course objectives, expectations, content and schedule for the third semester we offered the course.

Supplemental Figure 3. Pre-course survey, Spring 2017. On the first day of the class, enrolled students completed this survey to provide demographic information, describe their level of comfort under a variety of circumstances engaging with their research mentors, and indicated their familiarity with concepts to be covered in the course.

Supplemental Figure 4. Post-course survey, Spring 2017. On the final day of class, students completed a survey to assess learning and collect student feedback.

Supplemental Table 1. Course activities. Under each of the three main areas of focus, the major activities of the class are described.

Supplemental Table 2. Rubric for scoring video recordings of students' introductions. Each component was assigned a value of one, two, three or four corresponding to the level of proficiency. Based on the emphasis given each component during the course, these were assigned the weights shown in the first column. The final score for the assignment was determined summing the product of the component scores and these weights.

Supplemental Table 3. Rubric for scoring students' written abstracts. Each component was assigned a value of one, two, three or four corresponding to the level of proficiency. Based on the emphasis given each component during the course, these were assigned the weights shown in the first column. The final score for the assignment was determined summing the product of the component scores and these weights.

Supplemental Table 4. Rubric for scoring the Content components of students' slides. Each component was assigned a value of one, two, three or four corresponding to the level of proficiency. Based on the emphasis given each component during the course, these were assigned the weights shown in the first column. The final score for the assignment was determined summing the product of the component scores and these weights.

Supplemental Table 5. Rubric for scoring the Style components of students' slides. Each component was assigned a value of one, two, three or four corresponding to the level of proficiency. Based on the emphasis given each component during the course, these were assigned the weights shown in the first column. The final score for the assignment was determined summing the product of the component scores and these weights.

38   Supplemental Table 6. Rubric for scoring video recordings of the Content components of
39   student's oral presentations. Each component was assigned a value of one, two, three or
40   four corresponding to the level of proficiency. Based on the emphasis given each
41   component during the course, these were assigned the weights shown in the first column.
42   The final score for the assignment was determined summing the product of the
43   component scores and these weights.

44   Supplemental Table 7. Rubric for scoring video recordings of the Style components of
45   student's oral presentations. Each component was assigned a value of one, two, three or
46   four corresponding to the level of proficiency. Based on the emphasis given each
47   component during the course, these were assigned the weights shown in the first column.
48   The final score for the assignment was determined summing the product of the
49   component scores and these weights.

50   Supplemental Table 8. Bivariate analysis of demographic factors influencing changes in
51   comfort interacting with mentors. Subgroups of students are shown that demonstrate
52   statistically significant improvements in their comfort level interacting with mentors.

Supplemental Figure 1: Course Components and Self-Reported Learning

INTRO-D 480 **Fall**
Communicating in Science for Undergraduates **2016**
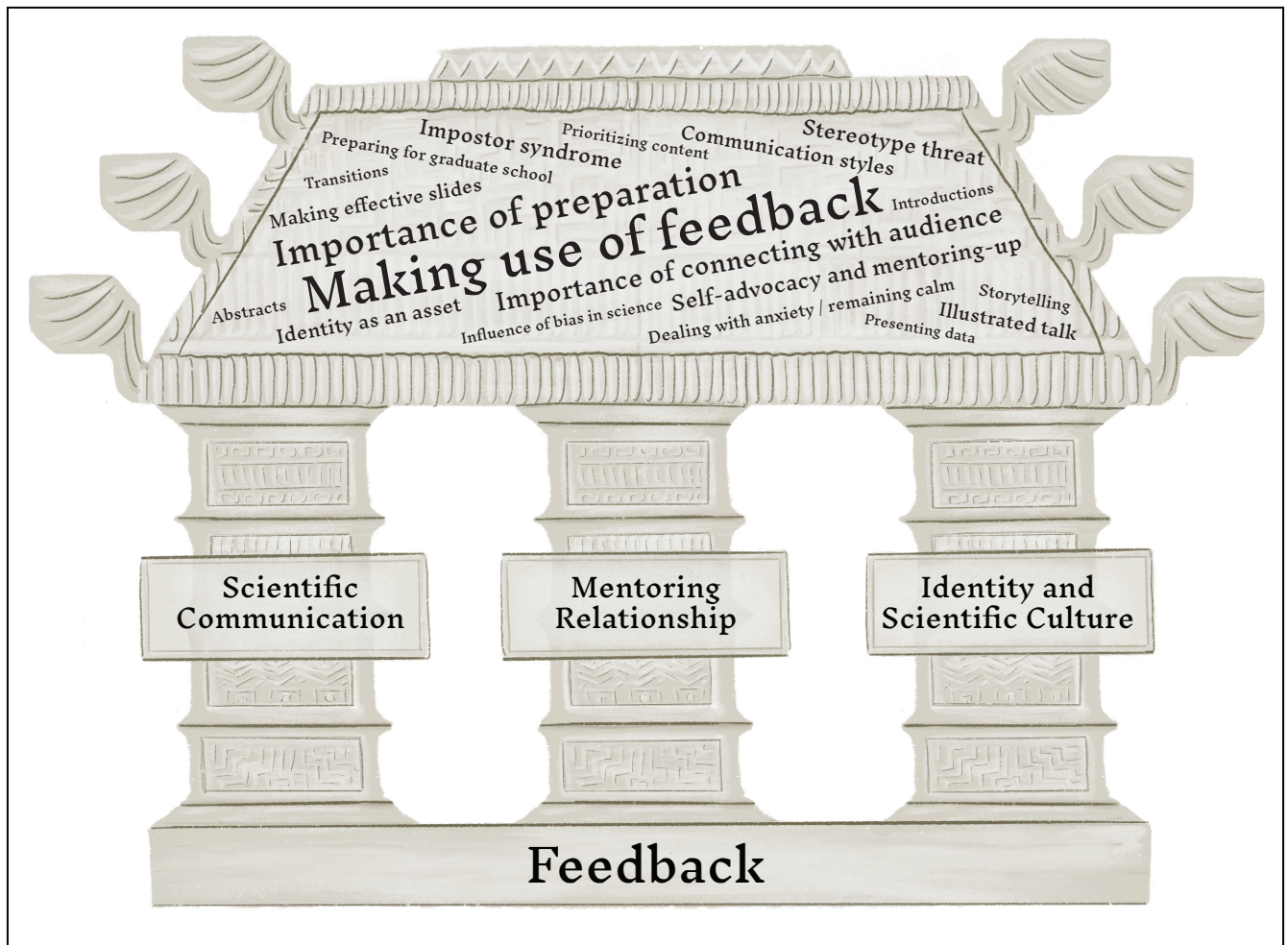
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Course Information

Course Title: Communicating in Science for Undergraduates

Location: Integrated Sciences Complex, ISC 2003
Time: Monday/Wednesday 8:30-9:50AM

Prerequisites: 1. Current undergraduate researcher working on a research project
                          2. Completion of a pre-course questionnaire

Course
Description: This scientific communication course is an elective designed for undergraduates actively engaged in research. The course objectives are to improve students' ability to: 1) communicate scientific research and its purpose effectively, in oral and written forms, to a variety of audiences; 2) develop more engaging and effective relationships with research mentors; and 3) understand the cultural context of science, individual identities and the critical roles they play in science careers. Mastery of these skills is essential to success as scientists. Learning these skills early will allow a trainee to be better prepared for next steps, including graduate and professional school and first jobs.

INTRO-D 480 Spring 2017
Communicating in Science for Undergraduates

Course Objectives: By fully participating in this course, one will be able to:

1. Communicate scientific research and its purpose effectively, in oral and written forms, to a variety of audiences
2. Develop more effective relationships with mentors and colleagues
3. Understand the cultural context of science, individual identities and the critical roles they play in scientific careers

Blackboard: All course information and assignments will be posted on Blackboard.

Assignments: Each class requires pre-work that must be done prior to class. Assignments are due by 11:59PM the Sunday before class unless otherwise specified.

Course Expectations:

- Participation - Participation includes completing all required reading and writing assignments prior to class, attending class, thoughtfully participating in discussions, and taking responsibility for helping create a positive learning environment by arriving promptly, listening respectfully, and participating constructively.
- Absences - Attendance for each class session is essential. If you must miss class due to illness or other extenuating circumstances, please inform the professors as soon as possible with a written excuse. Pre-work assignments must still be submitted. Connect with your peers to discuss the material covered in class. Turn in a written summary of the topics missed to receive attendance credit for the day.
- Late Assignments – Late pre-work assignments will be accepted; however, full credit will not be given.

Grading

Grading: Students will receive a letter grade (A – 85-100%, B – 69-84%, C – 53-68%, D – 37-52%, F – 0-39%)

Assignment/Deliverable	Relevant Course Objective	% of Grade
Homework Assignments	1, 2 and 3	20
Scientific Abstract Drafts	1 and 3	10
Oral Presentation Preparation and Final Talk	1 and 3	40
Attendance, Participation and 3-2-1 Surveys	1, 2 and 3	30

INTRO-D 480 **Spring 2017**

Communicating in Science for Undergraduates

Methods of Instruction

Methods: The course will be taught using the inverted classroom approach. Pre-work assignments will be given to introduce students to new material. These assignments are to be completed and submitted prior to class. Class will be used to discuss and foster a deeper understanding and practical use of each topic. Several pre-work assignments require collaboration with the mentor. Please do not wait until the last minute.

Accommodations

Section 504 of the American with Disabilities Act of 1990 offer guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, you may obtain adaptation recommendations from the UMass Boston Ross Center (617-287-7430). You need to present and discuss these recommendations with the instructor within a reasonable period, prior to the end of the Drop/Add period.

Code of Student Conduct

Students are required to adhere to the Code of Student Conduct, including requirements for the **Academic Honesty Policy**, delineated in the University of Massachusetts Boston Undergraduate Program Catalog (https://www.umb.edu/life_on_campus/policies/community/code).

INTRO-D 480 | **Spring 2017**
Communicating in Science for Undergraduates

Course Schedule

Breakfast will be provided.

Highlighted = Mentors are always welcome, but we especially want them to attend highlighted

Session	Date	Topic 1	Topic 2
1 Wk1	1/23	Pre-course evaluation	Course Roadmap and Information and Intro to NMRN
2 Wk1	1/25	Scientific Storytelling	
3 Wk2	1/30	Introducing Yourself I	Mentor Interview Discussion
4 Wk2	2/1	Mentoring Relationships	Understanding Communication Styles
5 Wk3	2/6	Introducing Yourself II	Illustrated Talk Example
6 Wk3	2/8	Illustrated Talks I	
7 Wk4	2/13	**Abstract Exercise**	
8 Wk4	2/15	Introducing Yourself IV	Decision Making Bias
Wk5	2/20	NO CLASS- PRESIDENT'S DAY	
9 Wk5	2/22	Receiving Feedback and Learning Orientation	Mentor Communication Styles Discussion
10 Wk6	2/27	Illustrated Talks II	Layers of Identity
11 Wk6	3/1	Introduction to Interviews	Mock Interviews
12 Wk7	3/6	Introducing Yourself V	Elements of a Great Talk
13 Wk7	3/8	Implicit Bias	Presentations: Take Home Messages
Wk8	3/13	NO CLASS- SPRNG BREAK	
Wk8	3/15	NO CLASS- SPRNG BREAK	
14 Wk9	3/20	Imposter Syndrome	Review Abstracts
15 Wk9	3/22	Mentor Identity Interviews Discussion	Summarizing Research Papers
16 Wk10	3/27	Introducing Yourself VI	Graphic Displays of Data

17 Wk10	3/29	Review Background Slide	Stereotype Management
18 Wk11	4/3	Introducing Yourself VII	Review slides
19 Wk11	4/5	Illustrated Talks II	
20 Wk12	4/10	Public Speaking Anxiety	
21 Wk12	4/12	Difficult Conversations	
Wk13	4/17	NO CLASS- PATRIOT'S DAY	
22 Wk13	4/19	Practice Talks	
23 Wk14	4/24	Practice Talks	
24 Wk14	4/26	Practice Talks	
25 Wk15	5/1	Practice Talks	
26 Wk15	5/3	Practice Talks	
27 Wk16	5/8	Final Talks	
28 Wk16	5/10	Final Talks	

* 1. On a scale of 1-10, how important is it for a scientist to have strong communication skills?

* 2. Have you ever given an oral presentation using slides to an audience not including your research group meeting?

* 3. Please rate your ability to do the following:

	Very Poor	Poor	Average	Good	Excellent
Introduce yourself and your research to a researcher outside your own group	○	○	○	○	○
Present your research project formally in front of an audience	○	○	○	○	○
Create slides to accompany a formal presentation of your research project	○	○	○	○	○
Write a scientific abstract that concisely describes your research project	○	○	○	○	○

* 4. Name the sections of an effective scientific abstract.

* 5. How long have you been working with your current mentors?

Faculty Mentor

Graduate student/Postdoctoral Mentor

* 6. How comfortable are you doing the following with your mentor:

	Very uncomfortable	Mildly uncomfortable	Neutral	Comfortable	Very comfortable
Discussing goals	◯	◯	◯	◯	◯
Seeking feedback	◯	◯	◯	◯	◯
Receiving feedback	◯	◯	◯	◯	◯
Initiating a difficult conversation	◯	◯	◯	◯	◯
Managing a difficult conversation	◯	◯	◯	◯	◯

* 7. To what extent do you agree with the following statement: "The primary role of my mentor is to tell me what to do."

[ ] Strongly disagree

[ ] Disagree

[ ] Agree

[ ] Strongly Agree

* 8. Name things a mentee can do to have a successful relationship with their mentor

[ ]

* 9. How familiar are you with the following concepts?

	Unfamiliar	A little familiar	Moderately familiar	Familiar	Very familiar
Stereotype management	◯	◯	◯	◯	◯
Solo status	◯	◯	◯	◯	◯
Imposter syndrome	◯	◯	◯	◯	◯
Implicit bias	◯	◯	◯	◯	◯
Multiple components of identity	◯	◯	◯	◯	◯

* 10. Please define the concepts you are moderately to very familiar with. Include where you learned about each concept.

Stereotype threat

Solo status

Imposter syndrome

Implicit bias

Multiple components of identity

* 11. I am

○ male

○ female

○ gender non-binary

○ gender non-conforming

* 12. What is your ethnicity?

○ Hispanic or Latino

○ Non-Hispanic or Latino

* 13. Which race best describes you? (You may choose more than one.)

☐ American Indian or Alaskan Native

☐ Asian / Pacific Islander

☐ Black or African American

☐ White / Caucasian

☐ Other (please specify)

* 14. Did one or both of your parents/guardians graduate from college?

○ yes

○ no

1. On a scale of 1-10 (where 1 is not and 10 is very important), how important is it for a scientist to have strong communication skills?

2. Please rate the following:

	Very Poor	Poor	Average	Good	Excellent
BEFORE taking this course, how were you at discussing your research project informally?	○	○	○	○	○
AFTER taking this course, how are you at discussing your research project informally?	○	○	○	○	○
BEFORE taking this course, how were you at discussing your research project formally in front of an audience?	○	○	○	○	○
AFTER taking this course, how are you at discussing your research project formally in front of an audience?	○	○	○	○	○
BEFORE taking this course, how were you at creating slides to accompany a formal presentation of your research project?	○	○	○	○	○
AFTER taking this course, how are you at creating slides to accompany a formal presentation of your research project?	○	○	○	○	○
BEFORE taking this course, how were you at writing a scientific abstract that effectively describes your research project?	○	○	○	○	○

	Very Poor	Poor	Average	Good	Excellent
AFTER taking this course, how are you at writing a scientific abstract that effectively describes your research project?	○	○	○	○	○
(BEFORE taking this course, how were you at creating a poster that effectively describes your research project?)	○	○	○	○	○
(AFTER taking this course, how are you at creating a poster that effectively describes your research project?)	○	○	○	○	○

3. How comfortable are you doing the following with your mentor:

	Very uncomfortable	Mildly uncomfortable	Neutral	Comfortable	Very comfortable
Communicating goals	○	○	○	○	○
Navigating a difficult conversation	○	○	○	○	○
Expressing your opinion	○	○	○	○	○
Receiving feedback	○	○	○	○	○

4. The primary role of my mentor is to tell me what to do.

True	False
○	○

5. What are the most valuable things you learned in this course?

6. An abstract is a short summary of your research, typically one paragraph long. Write the first two sentences of an abstract that describes your research.

7. How familiar are you with the following concepts?

	Unfamiliar	A little familiar	Moderately familiar	Familiar	Very familiar
Stereotype threat	○	○	○	○	○
Solo status	○	○	○	○	○
Imposter syndrome	○	○	○	○	○
Communication styles	○	○	○	○	○
Implicit bias	○	○	○	○	○

8. Please define the concepts you are moderately to very familiar with.

Stereotype threat

Solo status

Imposter syndrome

Communication styles

9. How have the concepts you have defined above impacted your career as a scientist?

10. Please write a few thoughts you want the next class to know about the social factors we discussed in class and how they are relevant to carrying out scientific research. Your feedback will be kept anonymous.

11. How do feel about your final talk?

○ Very unhappy

○ Unhappy

○ Mixed

○ Pleased

○ Very pleased

What is your reaction to the amount of work it took to create your final talk?

12. Which of the following techniques did you use to combat anxiety for your final presentation? (Check all that apply.)

☐ practicing

☐ breathing deeply

☐ touching a stone

☐ finding friendly faces in the audience

☐ pausing to take a drink of water

☐ doing the power pose

☐ familiarizing yourself with the space/environment beforehand

☐ focusing away from anxiety causing thoughts

☐ none. I did not use techniques to combat anxiety.

other, please specify.

13. What communication skills do you still need to improve?

14. What components of the course did you want to know more about?

15. Please share your ideas about the most valuable change or addition that could be made to improve this course in general.

16. Which components of the course were least useful? Why?

Supplemental Table 1: Course Activities

Topic Area	Activity	Details	Notes
	Giving/receiving feedback	Students received instruction on how to give and receive feedback (growth mindset, Dweck, 2017). Students applied these principles through many iterative rounds of providing and receiving presentation feedback from peers.	The ongoing emphasis on feedback and the progressive escalation of activites involving feedback shited student's initial reluctance to provide or receive feedback to embracing it, such that by the end of the course feedback was, primarily, student-led.
	Giving Constructive Feedback	Students worked in trios, each reading a different scientific abstract containing several flaws. Students prioritized and delivered constructive feedback. The receiver took notes and delivered their own "feedback about the feedback"[1].	
Scientific Communication	Drafting a scientific abstract I	Students wrote an abstract about their research. After receiving feedback from their research mentor, a course instructor, and student peers, students submitted revised abstracts.	
	Drafting a scientific abstract II	Students were given an as-yet-unpublished manuscript and asked to write a specific element of an abstract for it. In class students reviewed, combined, and edited all contributions to create a complete abstract for the manuscript.	Using an unpublished manuscript eliminates any temptation to search for the actual abstract.
	Recorded introductions	In most class sessions, students brief oral introductions (elevator pitches) were recorded.	

		Students reviewed recordings and instructor/peer feedback to foster improvement.	
	Illustrated talks	Students gave "illustrated talks", in which they explained their research projects using simple sketches drawn in real-time. Students who were listening were encouraged to interrupt whenever points were not clear and provided feedback afterward.	The interruptions were valuable both to emphasize the desired conversational tone of the talk and to provide the speaker with immediate feedback about what was not clear.
	Oral Presentations	All students gave formal, "final oral presentations" about their research projects. Students began early in the semester by making a rough outline of their talk, and writing down the key messages they hoped the audience would take away. Over time, students made slides for specific portions of their talk (e.g., starting with background and significance) and revised until a final slide deck was prepared. Students received feedback from other students, course instructors, and visiting mentors, on the organization and delivery of the presentation as well as on the slides, images, and data.	The final presentation represented the culmination of the work of the entire semester. Having students deliver these in a formal setting, with their mentors, faculty, and friends attending, was intended to contribute to students' self-efficacy concerning scientific communication.
Mentoring Relationships	Mentor Interview 1: Career Path/Journey	Students asked their mentors: Why did they want to be a scientist? What do they think are the keys to their	In addition to building connection, discussing these questions enabled mentors and mentees to align their expectations

		success? Who has had the greatest influence on them? How would they like the student to bring questions to them? What expectations do they have for the student this semester?	(Balster et. al., 2010 and Pfund et. al., 2014).
	Mentor Interview 2: Communication Style	After completing their communication style inventory, students were asked to draw on their own observations to predict their mentors' communication styles. Students' mentors were asked to complete a communication style inventory. Class discussions focused on how to use this information to communicate better with their mentor.	Asking the mentors to complete the inventory as part of the class reduced the barriers to talking about communication within the mentoring dyad.
	Mentor Interview 3: Identity[2]	Students were asked to ask their mentors the same questions they themselves answered previously about the dominant aspects of their identities at work versus at home, and how and why they might differ. The in-class discussion focused on obvious and less obvious similarities and differences between students' and mentors' identities and the possible impact these differences may have on the relationship.	Engaging mentors in conversations about the salience of their identities in research was both surprising and rewarding to both students and their mentors.
	Mentoring Up	An interactive workshop (based on Lee, Pfund and Branchaw, 2015) about the importance of	

Supplemental Table 1: Course Activities (continued)

		mentorship and the students' opportunities and responsibilities to optimize these relationships.	
	Difficult conversations	An interactive workshop about how to prepare for and engage in difficult conversations, and how to learn and grow from these conversations.	Difficult conversations of many kinds were discussed, including personal ones as well as those with their research mentors, faculty advisors, and other members of the research community.
	Strategies to overcome fears and anxiety around speaking	Instructors and mentors shared their experiences and strategies to reduce anxiety before giving a presentation.[2]	This engagement both provided tips and normalized nervousness about talking in front of groups.
Social Identities and Science	Implicit Bias/Decision Making	Outside of class,students read articles on the origins and impact of implicit bias (Kahneman, 2012 and Moss-Racusin et. al., 2012) and answered discussion questions about the impact of the findings and principles in their lives; answers discussed in class	
	Imposter Syndrome	Outside of class, students read Roché, 2014 and answer questions about recognizing and combating the impostor phenomenon; follow up discussion in class.	
	Stereotype threat	Outside of class students read McGee and Martin, 2011 and answered questions about recognizing and combating stereotype threat; discussed in class.	

[1]Could also go under mentoring relationships

Supplemental Table 1: Course Activities (continued)
[2] Could also go under social identities and science

References

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Dweck, C. S. (2017). *Mindset: Changing the way you think to fulfil your potential*. New York: Robinson.

Kahneman, D. (2012). Of 2 Minds: How Fast and Slow Thinking Shape Perception and Choice. Scientific American, Reprinted from Thinking, Fast and Slow.

Lee S., McGee R., Pfund C., & Branchaw J.. (2015). Mentoring Up": Learning to Manage Your Mentoring Relationships. In G. Wright (Ed.), *The mentoring continuum : from graduate school through tenure*. Syracuse, New York: Graduate School Press of Syracuse University.

McGee, E. O., & Martin, D. B. (2011). "You would not believe what I have to go through to prove my intellectual value!" Stereotype management among academically successful Black mathematics and engineering students. American Educational Research Journal, 48(6), 1347-1389.

Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. Proceedings of the national academy of sciences, 109(41), 16474-16479.

Pfund, C., Handelsman, J., & Branchaw, J. (2014). *Entering mentoring*. WH Freeman.

Roché, J. (2014). Conquering impostor syndrome: Lessons from female and minority business leaders. Leader to Leader, 2014(74), 13-18.

Supplemental Table 2: Rubric for Scoring Video Recordings of Students' Introductions

Weight	Non-verbal	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Eye contact	No eye contact with audience, stares only at the camera or notes.	Displayed minimal eye contact with audience. Spends most of the time staring at camera or notes.	Consistent use of direct eye contact with audience. Minimal time staring at camera or notes.	Holds attention of entire audience with the use of direct eye contact.
1	Poise	Tension and nervousness is obvious and constant; easily flustered by mistakes. Unable to recover.	Displays mild anxiety; has trouble recovering from mistakes.	Makes minor mistakes, but quickly recovers from them; displays little or no anxiety.	Student displays relaxed, self-confident nature about self, recovers quickly from mistakes.
1	Body Language	Body position indicates withdrawal. Rigid, no movement or descriptive gestures. Student is hugging her/his self.	Very little movement or descriptive gestures, hand and arm movement distracting. Student's posture fluctuates.	Made movements or gestures that enhances articulation.	Upright posture, shoulders are straight, body relaxed. Movements are fluid and helpful to audience.

Weight	Verbal	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Enthusiasm	Doesn't seem interested in topic presented.	Seems relatively uninterested toward topic presented.	Occasionally shows positive feelings about topic.	Conveys strong enthusiasm for the work.
1	Elocution (Volume and tone)	Student speaks too quietly to be heard, mumbles, and incorrectly pronounces terms. Student consistently presents information in a robotic manner going down on a check list.	Student is often hard to hear or understand. Student often sounds like they are robotically going down a list. Student incorrectly pronounces terms.	Student is largely clear and audible, mostly with a natural conversational tone. Student pronounces most words correctly.	Student consistently uses a clearly audible voice and a natural, conversational tone. Student correctly pronounces of terms.
2	Language (Jargon)	Language choices are limited, peppered with jargon, inaccessible for the audience.	Language used is often jargon that makes it hard to understand the content.	Language used is mostly familiar, some jargon is mentioned but defined, so that the audience can understand the content.	Language is familiar and appropriate for the audience.

Weight	Content	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Organization	There is no logical sequence of information.	Student jumps around in a confusing way.	Student presents most of the information in a logical sequence.	Student presents information in logical sequence.
0.5	Length and balance	Student omits more than one section.	Student omits a key section, provides too much or too little information for the different sections.	Student covers all the sections but, in an obviously unbalanced way.	Student covers all the critical information** in a concise manner with appropriate balance between the sections.

Sections required: full name, academic year, research group, general area of work, what specifically they are working on, and why it matters

Supplemental Table 3: Rubric for Scoring Students' Written Abstracts

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Title	Too long or too short, does not capture the interest of the audience nor provides information about what will be presented, is stated as a question	Not too long or too short, but could be shortened, attempts to capture interest, but does not provide information about what will be presented, not a question	Appropriate length, however, does not captures the interest of the audience and provides information about what will be presented, not a question	Appropriate length, captures the interest of the audience and provides information about what will be presented, not a question
1	Background/ Significance	Abstract does not provide an overview the main story and scope of work. It also does not foster an understanding of the relevance and importance of the research.	Background could be clearer but provides an overview the main story and scope of work. It provides a statement of the relevance and importance of the research but needs improvement.	Background could be clearer but provides an overview the main story and scope of work. Fosters an understanding of the relevance and importance of the research.	Background contains a clear overview of the topic and scope of work and fosters an understanding of the relevance and importance of the research.
1	Statement of Problem with relevant Question/Hypothesis	Problem is not stated. Research question and or hypothesis is not stated in the abstract.	Research question and or hypothesis is stated but needs some improvement to be readily apparent to the reader. No rationale given.	Research question and or hypothesis is stated and apparent to the reader but could be tightened. Logic could be clearer.	Research question and or hypothesis is clearly stated and readily apparent to the reader. Rationale is stated and is logical.
2	The "So What"	A description of why the research is being conducted is not present	A description of why the research is being conducted is present but is not clearly stated.	A description of why the research is being conducted is clearly stated but does not connect to the broader background.	A description of why the research is being conducted is clearly stated and connects the research to the broader background.
1	Experimental Design/Methods/ Approach	No mention of methods, methods not at all clear, too many different methods shown, or described in too much or too little detail	Methods somewhat confusing because either too many different methods shown, or described in too much or too little detail	Methods are described but not clearly, lacks logical connection between steps of methods or between methods and aims or results	Key methods are described clearly, in logical order, with only those details needed to understand results
1	Results/Findings	Abstract does not provide an explanation of what was discovered, accomplished, collected or produced	Results section provides an explanation of what was discovered, accomplished, collected or produced but needs some improvement to be readily apparent to the reader.	Results section provides an explanation of what was discovered, accomplished, collected or produced.	Results section provides a succinct and specific explanation of what was discovered, accomplished, collected or produced.
1	Summary/ Conclusions	No clear summary or conclusion provided, or conclusions simply restatement of previous statement	Summary or conclusion present, with insufficient reflection	Clear summary or conclusion given but without implications	Clear summary of what was learned and implications
1	Implications/ Speculation/ Recommendation	Abstract does not evaluate what the results mean to the investigation or describe how the investigation fits into the larger field of science with possible implications.	This section evaluates what the results mean to the investigation, describes how the investigation fits into the larger field of science and possible implications but needs some improvement to be readily apparent to the reader.	Evaluates what the results mean to the investigation, describes how the investigation fits into the larger field of science and possible implications but could be tightened.	Clearly evaluates what the results mean to the investigation, describes how the investigation fits into the larger field of science and possible implications.
0.5	Length	Abstract is less than 150 words or greater than 300. Inappropriate length of one or more sections.	Abstract is within appropriate word limit but one or more sections are inappropriate lengths.	Abstract is within recommended length, but is wordy and repetitive. Could be more succinct.	Abstract is short and clear, with each section no longer than 2-3 sentences. It meets the recommended length between 200-300 words.

Supplemental Table 3: Rubric for Scoring Students' Written Abstracts (continued)

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
2	Audience & Language	Abstract is not framed or targeted for the appropriate audience. It uses passive voice, some questionable word choices, and or many instances of jargon.	Abstract is mostly written in active voice, has a few instances of poor word choice or jargon.	Abstract is targeted for the appropriate audience; written in active voice, uses appropriate word choices, however, has some jargon.	Abstract is clearly framed and targeted for the appropriate audience. It is written in active voice, uses appropriate word choices and excludes all jargon.
1	Grammar	Abstract has four or more grammatical errors.	Abstract has no more than three grammatical errors.	Abstract has no more than two grammatical errors.	Abstract has consistent verb tense and correct spelling, capitalization, punctuation, and defines all acronyms.

Supplemental Table 4: Rubric for Scoring the Content Components of Students' Slides

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Slide Headings	Headings are vague, simply descriptive (e.g. "Background", "Methods" hypothesis) and do not convey slide content or takeaway message. Note: "Conclusions" is acceptable as a slide title	Some headings are declarative statements, effectively summarize facts or findings, introduce slide content	Most, but not all, headings are declarative statements, summarize facts or findings, introduce slide content	Headings are declarative statements, effectively summarize facts or findings, introduce slide content
1	Introduction/Background General Background Science	General background not covered	General background science is scant or does not relate to the present study	General background provided is relevant but too little or too much is provided	Appropriate general background, clearly is explained and connected to aims (see below)
1	Introduction/Background Motivation	Motivations for current work neither clear nor logical	Insufficient coverage of motivation, leaves audience unsure why studies are being done	Motivations are relevant, but too little or too much detail is provided	Motivations are clear and logical
2	Statement of Problem with relevant Questions, Hypotheses or Aims	No statement of main problem and research questions, hypotheses or aims	Either main problem or research question, hypothesis or aims, but not both, are stated	Main problem and research aims are covered but are unclear	Clear statement of problem and research aims
1	Methodology/ Experimental Design or Approach	No mention of methods, methods not at all clear, too many different methods shown, or described in too much or too little detail	Methods somewhat confusing because either too many different methods shown, or described in too much or too little detail	Methods are described but not clearly, lacks logical connection between steps of methods or between methods and aims or results	Key methods are described clearly, in logical order, with only those details needed to understand results
2	Significance	Significance of findings are not covered	Significance of findings described but unclear	Significance of most findings described	Significance of each major finding described clearly
1	Summary/Conclusions	No clear summary or conclusion provided, or conclusions simply restatement of previous statement	Summary or conclusion present, with insufficient reflection	Clear summary or conclusion given but without implications	Clear summary of what was learned and implications
1	Future Directions	No future directions described	Very brief description of future work	Some description of future work but significance not obvious, or future work not connected to findings	Future directions are outlined, and are logical extensions of the findings
0.5	Acknowledgements	Lack of acknowledgements slide	Acknowledgement slide included, but seems incomplete or role of people being acknowledged not clear	Acknowledgements are present, but not organized in a logical manner	Clear, well-organized acknowledgement slide indicating names and roles of people

Supplemental Table 5: Rubric for Scoring the Style Components of Students' Slides

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Slide Background	Slide background visually distracting or interferes with readability of title or other slide elements	Slide background visually distracting or sometimes interferes with readability of title or other slide elements	Slide background modestly visually distracting or occasionally interferes with readability of title or other slide elements	Slide background gives unified look to presentation without compromising readability
1	Color	Colors used for text make all slides difficult to read, too bright or lack the contrast needed to be viewed easily by the audience Multiple text colors, apparently used at random, not used consistently	Colors used for text on some slides are too bright or lack the contrast necessary to be viewed easily by the audience Colors used for a specific purpose but inconsistently some of the time, thus could confuse the audience	Background and text colors have appropriate brightness and contrast necessary for an audience to view easily on most slides When color is used for a specific purpose, it is used consistently, most of the time, to aid the audience's understanding	All slides have text in appropriate brightness and contrast necessary for an audience to view easily. If additional text colors are used it is for specific purpose. Additional text color used consistently to aid the audience's understanding
1	Animation	Animation effects are distracting, many different styles of animation used, excessive use of animation, OR animation is not used when it would be most effective	Animation used ineffectively or frequently distracting to audience. Animation is sloppy, animated elements are not grouped appropriately	Animation occasionally distracting, two or fewer types of animation are used sparingly OR animation occasionally not used when it would simplify presentation	If used, animation is simple and used sparingly to simplify presentation aid audience's understanding. Animation is not used, but is not necessary.
1	Consistency of Format	Slides do not have consistent layout/formatting throughout the deck	Some slides have consistent layout/formatting throughout the deck	Most, but not all slides have consistent layout/formatting throughout the deck	Slides have consistent layout/formatting throughout the deck
2	Figures Graphs and data	Includes too many figures, rather than just the key ones. Figures are confusing, unlabeled and/or the information they contain seemingly irrelevant	Contains redundant or unnecessary figures, components of figures are unclear, unlabeled	Most figures are clear, labeled and important to the presentation	Includes just figures needed to support main findings. All figures clear and labeled, allow audience to quickly understand results
2	Figures Readability	Cluttered, minimal open space, hard to read	Many cluttered, lack open space, many hard to read	Few cluttered, most have open space, most easy to read	Uncluttered, lots of open space, all elements easy to read
1	Space	Slides overcrowded, visually cluttered making it hard to quickly comprehend. Too many elements per slide or elements are arranged strangely on the slide without much empty space on all slides. Or, too much empty space, slides lack simple, relevant, interesting visual elements.	Most slides are overcrowded, with elements arranged strangely on the slide without much empty space, or most slides lack simple, relevant, interesting visual elements	Most slides are not overcrowded, they have elements arranged in a logical, aesthetically pleasing way that provides ample empty space resulting in slides that are quickly understood	All slides have elements laid out on the slide in a logical, aesthetically pleasing way that provides ample empty space, resulting in slides that are quickly understood
2	Text Amount	All slides contain too much text and require a long time to read. Text written in complete sentences, rather than phrases, taking audience's attention from the presenter.	Some slides contain too much text and require a long time to read. Text written in complete sentences, rather than phrases, taking audience's attention from the presenter.	Most slides contain an appropriate amount of text written in phrases that are easily digested by an audience	All slides contain an appropriate amount of text, written in phrases that are easily digested by an audience

Supplemental Table 5: Rubric for Scoring the Style Components of Students' Slides (continued)

2	Text Size	Font sizes on all slides are hard to read, font size inconsistent. Most text less than 24pt, inconsistent use of different sizes	A moderate amount of text in the slide deck is less than 24pt	Some, but very little text in the slide deck is less than 24pt	All text in the slide deck is 24pt or greater. Size effectively differentiates different levels of text.
1	Length	Slide deck for 8 minute talk has fewer than 6 or greater than 16 slides	Slide deck for 8 min talk has 6-8 or 14-16 content slides	Slide deck for 8 min talk has 8-9 or 13-14 slides	Slide deck for 8 min talk has 10-12 total slides

Supplemental Table 6: Rubric for Scoring Video Recordings of the Content Components of Student's Oral Presentations

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Introduction	Doesn't introduce self, starts body of presentation immediately	Provides only name or institution	Provides both name and institution	Provides a full introduction of name, institution, and topic
1	Background	Background not covered	Insufficient information is provided to understand the present study, or information provided does not relate to current study	Background information is relevant but too little or too much is provided	Relevant and appropriate amount of background provided to understand the study
2	Motivation	Motivation is not covered	Insufficient information provided and leaves the question of why the study is being performed	Too much or too little explanation is provided	Motivation is clearly stated such that audience knows why this study is being performed
1	Statement of hypothesis/aims	No mention of hypothesis, research question, or research aims	Either main question or aims, but not both, are provided	Main question and research aims are covered but are unclear	Clear statement of research question/hypothesis and research aims
1	Methodology	No mention of methods	Methods are described, but not connected to aims or results	Methods provided but too much or too little detail given	Key methods described with only those details needed to understand results
1	Results (if data present)	Does not identify features and patterns in data	Identifies some features and patterns but misses most opportunities to employ them to future understanding	Points out features or patterns in data that do not help in understanding	Points out relevant features in data and concepts
1	Results (if there is no data)	Does not identify experiments to test research question/ hypothesis	Identifies experiments to test research question but does not explain why the experiments will be performed	Identifies experiments to test research question and why they will be performed but not what the potential results would indicate	States what experiments will be performed to test hypothesis/ answer research question, and what the results from those experiments would mean
1	Conclusions	No clear summary or conclusion provided	Brief concluding summary provided	Summary provided has too much information or too little information	Clear summary of what was learned
2	Significance/Implications	Significance of findings is not provided	Significance of findings described but unclear or not relevant to conclusions	Significance of most findings described and are somewhat related to conclusions	Significance of each major finding described clearly related to conclusions
1	Future Directions	No future directions are described	Future work briefly described but does not relate to findings	Description of future work, but some are not related to findings	Future directions are outlined, are logical extensions of findings
0.5	Acknowledgements	Does not acknowledge colleagues or funding	Acknowledgement slide but little or no verbal acknowledgement	Verbal acknowledgement but does not follow slide logically	Clear slide and verbal acknowledgement of people and their roles

Supplemental Table 7: Rubric for Scoring Video Recordings of the Style Components of Student's Oral Presentations

Weight	Criteria	Beginning (1)	Developing (2)	Proficient (3)	Mastery (4)
1	Balance	No balance in presentation. Sections of presentation are missing	Too much time was spent on two different sections, not enough time was spent on other sections	Too much time spent on one section	Presentation is well-balanced. All parts included
1	Figures	No figures or animations used	Limited attempts to use media/are of minimal utility in illustrating ideas or are detrimental to understanding	Use of media varies between appropriate and ineffective	Use of media (animations, figures, and videos) aids audience understanding
2	Language	Language is inappropriate (too technical)/terminology is undefined	Language switches between technical and everyday language causing confusion. Terminology is rarely defined	Language is often appropriate but some language is too technical; some terminology is not defined	Appropriate language used for the audience. Terminology is clearly defined
1	Scaffolding	Starts too high or ends too low. No evidence of incremental building of understanding. Presentations lacks any connections between material	Either starts too high or ends too low (underestimate the ability of the audience). Incremental building of understanding evident in some cases but not all	Starts with level of comprehension either slightly too high or too low. Attempts to build understanding but some steps are too large. There is a gap	Starts out at an appropriate level of comprehension. Builds understanding to develop complicated ideas
1	Transitions	There are no clear connections between parts of the talk	It is rarely clear how the parts of the presentation relate to each other	It is not always clear how the parts of the presentation relate to each other	Clear connections are made from one part of the presentation to the next
1	Poise	No eye contact is made, presenter is fidgeting or reading from a screen	Some eye contact is made but presenter fidgets and frequently reads from a screen	Eye contact is made most of the time. Limited reading from a screen. No fidgeting/limited use of um	Presenter makes eye contact and does not read from a screen with audience, does not fidget or say um
1	Pace/Rhythm	The pace of the presentation is too fast or too slow for the whole presentation	Presenter goes too fast or too slow for whole sections of the presentation	The presenter speaks too quickly sometimes but generally has a good pace	Presenter paces their speech so that audience can stay with them
1	Voice	Speaker is hard to hear due to mumbling or being too quiet	Voice goes back and forth between being loud/clear and soft/mumbling	Voice is loud most of the time with minimal mumbling	Voice is loud and clear. No mumbling

Supplemental Table 8: Bivariate Analysis of Demographic Factors Influencing Changes in Comfort Interacting with Mentors

Topic Area	Demographic	Mean Improvement	N	Significance
Navigating Difficult Conversations	Women	0.62	13	0.046
	Men	-0.60	5	
	First Generation	1.00	7	0.033
	Not First Generation	-0.18	11	
Receiving Feedback	Latino	1.00	3	0.017
	Not Latino	0.07	15	