Objective 2: Use multiple strategies for improving communication (in person, at a distance, across multiple mentees, and within appropriate personal boundaries) (15 min)

ACTIVITY #2: Brainstorming Communication Strategies (15 min)

ASK ► Brainstorm a list of barriers to good communication.

NOTE ► Record the list on the whiteboard or flip chart, and then have mentors choose two or three barriers and discuss practical ways to overcome them. Mentors could generate a table such as the one presented here.

Barrier to Effective Communication	Solutions to Overcome Barrier	Indications That Communication Has Improved
Example: Lack of time to meet one-on-one	Frequent email, telecoms, or instant messaging chat time	Fewer misunderstandings and stalls in research progress

NOTE ► Alternatively, have the mentors create a list of all the forms of communication used by them and their mentee (face-to-face meetings, email, sticky notes, phone calls, etc.). Organize the resulting list by types of communication and assign each type to a group of two to three mentors. Each subgroup should then discuss ways each method can be improved. At the end, have the small groups report out. Record all ideas on the whiteboard or flip chart. You may want to send a compiled list to the entire group.

Mentoring Tool

Research Project Outline & Science Abstract*

Objective: Students will summarize their research project for their peers and write a scientific abstract.

PARTICIPANT MATERIALS

Research Group's Focus:

Research Project Title:

Introduction/Background:

Identify and summarize the key background information needed to understand your research project. Write these pieces of information as a *bulleted list of statements*. Your hypothesis or research question should follow from this information.

-
-
-

Hypothesis or Research Question:

Relevance and Implications of Your Research Project:

Why is your research important? What may be the potential implications of your results? How will your project benefit basic research, human health, or development of a commercial product?

Experimental Design and Potential Results:

Outline the experiments you will do to test your hypothesis. For each experiment, explain

1. the technique(s) that will be used and the reason(s) for selecting that technique.

*From Branchaw, J. L., Pfund, C., and Rediske, R. (2010), *Entering Research: A Facilitator's Manual: Workshops for Students Beginning Research in Science*, W.H. Freeman & Company.

2. the type of data that will be collected and why this type of data will inform the hypothesis.

3. all the potential results and whether each would support, or not support, your hypothesis. Draw what the predicted results will look like, if applicable (e.g., gel, microscope image, data table, or graph).

Timeline:

Outline a weekly or monthly timeline for your project. Be sure to refer to each of the proposed experiments (or parts of the experiments), allow time for analysis of data, and allow time for the preparation of a presentation of the data (e.g., poster or oral presentation).

Abstract:

Synthesize the core information in your outline and write a scientific abstract of 200 words or less.

Mentoring Tool

Scientific Article Worksheet*

Objective: Students will learn strategies to effectively and efficiently read scientific articles.

PARTICIPANT MATERIALS

Title:

Authors:

Journal:

Year:

The Basics:

1. What hypothesis or research question does the paper address?

2. What experiments were done to test the hypothesis or investigate the research question?

3. What are the major conclusions?

4. What evidence supports each of the conclusions?

The Critique:

1. Is the paper well written? How do you know?

2. Do the conclusions seem logical given the data presented? Why or why not?

3. Why are the conclusions important?

4. What were the best aspects of the research presented, and how could it be improved?

*From Branchaw, J. L., Pfund, C., and Rediske, R. (2010), *Entering Research: A Facilitator's Manual: Workshops for Students Beginning Research in Science*, W.H. Freeman & Company.

Additional Resources:

1. What are the basic concepts that you need to know to understand the science presented in your paper?

2. Identify a chapter/section in a textbook that outlines these basic concepts. Is reading this helpful to your understanding?

3. What other information or resources would help you better understand the paper?

Further Questions:

Write *at least* five comments or questions about the article to discuss with your mentor.

1.

2.

3.

4.

5.

Case Study: Ready Mentee

An experienced undergraduate researcher was constantly seeking input from his mentor on minor details regarding his project. Though he had regular meetings scheduled with his mentor, he would bombard her with several emails daily or seek her out any time she was around, even if it meant interrupting her work or a meeting that was in progress. It was often the case that he was revisiting topics that had already been discussed. This was becoming increasingly frustrating for the mentor, since she knew the student was capable of independent work (having demonstrated this during times she was less available). The mentor vented her frustration to at least one other lab member and wondered what to do.

Guiding Questions for Discussion:

1. What are the main themes raised in this case study?
2. What should the mentor do?
3. How do you determine how much independence a mentee is ready for?

Case Study: The Slow Writer

A senior undergraduate student in my group is adept at performing experiments and analyzing data but is a very slow writer. Last semester, I set multiple deadlines that this student missed, while another student in my group wrote an entire senior thesis chapter, coauthored a paper, and did experiments. Over winter break, the slow writer had a breakthrough and produced a fairly reasonable draft of her senior thesis. To avoid delays in publications, I have begun revising this draft, rather than simply providing comments. However, to graduate, I realize that she must write the thesis herself, as well as the section of a manuscript she wants to coauthor. Setting deadlines for detailed outlines, thesis sections, and figures hasn't worked. Communicating the importance of writing to the scientific endeavor hasn't worked. Encouragement hasn't worked. Veiled threats don't seem professional. Other than being patient, what should I do?

Guiding Questions for Discussion:

1. What are the main themes raised in this case study?
2. What could have been done to avoid this situation? What should the mentor do now? What should the mentee do now?
3. How do you find out what expectations your mentee has of you and for their research experience?

Mentoring Research Writers

*by Bradley Hughes**

Recognizing the Power of Writing as a Component of the Research Process

As a mentor you have a great opportunity to encourage your trainees to set high goals for their research writing and to help them achieve those goals. You should recognize, in fact, that you have a serious responsibility to motivate and to help researchers-in-training become excellent writers. Why should you and your trainees make writing a priority? The answer is clear to all experienced researchers: researchers earn their living and develop their careers *through the writing they do*—writing proposals to fund research, writing conference abstracts and posters and papers to disseminate new knowledge and to influence future research and the shape of their fields, documenting their research methods and findings, writing reviews of literature, writing reviews of colleagues' manuscripts, and writing letters of recommendation. Writing pervades the research process, and successful researchers spend a significant amount of their time planning, drafting, and revising complex forms of writing. Experienced researchers also know that writing is not just a way to communicate completed findings and polished arguments: writing is actually a powerful form of thinking and learning, one that clarifies thought and makes analyses and arguments more precise.

Acknowledging the Complexity of Research Writing

In order to appreciate the complexity of research writing and to guide new researchers, mentors need to understand that writing is a highly situated practice—that is, it is not a generic, general skill. Successful researchers need to achieve very specific purposes and speak persuasively to particular groups of readers. What is valued in writing and what is conventional and effective in writing varies across particular scientific communities and even within particular communities of researchers.

As researchers transition from writing within particular disciplines or professions to new ones, they often struggle to write successfully, even if they had success in previous writing situations. Given how varied purposes and audiences are for advanced research writing, as a research mentor, you should have intentional conversations about research writing with your mentees—working on and talking about writing are natural and important parts of training programs, and you should not expect new biomedical researchers to be accomplished writers from the start. Becoming an excellent research writer takes time, effort, and dedicated, consistent mentoring.

Mentors should also remember that researchers-in-training, like all students, bring varied literacy backgrounds to each new writing challenge. Some of your research trainees will have done lots of writing and reading, been held to high standards for written communication, and learned to receive and give critical feedback on writing. Others may feel that their intellectual strengths lie in quantitative rather than verbal areas. Some may have great strengths in oral communication rather than academic writing. Others may be multilingual writers, who are very skilled communicators in their first or second languages and who have great cross-cultural linguistic knowledge, but less experience writing and reading English. Some multilingual writers may have internalized organizational structures or styles for academic writing from their first language that are at odds with standard patterns in English. Still other writers may have a tenuous grasp on the subject that they are writing about,

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READING

and their conceptual struggles may manifest themselves in their writing. At the same time, many researchers find writing difficult and as a consequence avoid writing, procrastinate, and eventually end up in stressful time crunches that reinforce their dislike for writing.

Key Principles in Mentoring Writers

1. Signal from the very start and reinforce frequently that excellent writing is a high priority for you, for your research group, and for all successful researchers.
2. Figure out what your mentees already know about research writing and find ways to help them learn what they need to learn.
3. Work collaboratively with your research mentees to motivate them to write every week, sometimes every day.
4. Talk with your mentees regularly about their writing—analyzing successful examples, planning new pieces of writing, brainstorming, kicking ideas around, discussing drafts, and planning revisions.
5. Schedule meetings to plan and work on drafts. Make discussions of in-progress writing part of the culture and rhythm of your research group.
6. Give clear, specific, encouraging feedback. Start first with global concerns and then move on to more local, smaller concerns.
7. Be sure your feedback identifies strengths and potential as well as problems.
8. Honor and celebrate successful research writing within your research group.

Given what varied experiences and strengths researchers-in-training may bring, you should ask your mentees about their previous experience and about their perceived strengths and areas for improvement. Acknowledge that research writing is always hard work, especially when researchers are learning to write in a new field or in a new genre, when they are making arguments that are more complex than they have made before, or when they're not sure what their findings mean or what is interesting or important in their findings. For these reasons, research writers need their mentors to be patient and encouraging as well as critical. And above all, mentors need to *normalize revision*; revision is a normal and crucial part of writing, not a sign that a writer has failed because she or he did not achieve perfection in an early draft. Research shows that experienced, successful writers spend a lot of time revising their work.

Writing is hard work and time-consuming for mentees. Let's face it—helping mentees learn to become strong research writers is hard work and time-consuming for you as a mentor. Although the recommendations that follow should make the time you spend on mentoring more successful and effective for you and for the writers you are mentoring, there are no shortcuts. Reading drafts carefully and critically and charitably; discerning what is and what is not working well in a draft; giving clear, specific, helpful, and encouraging feedback; reading yet another draft; meeting to talk through your feedback and the writer's plan for revision—these critical tasks will always require concentration and time. But they are what every writer needs in order to learn and to improve—to become the strongest possible research writer they can be and to launch their research career.

Here are some specific strategies, drawn from research and practice, for mentors to try.

Before the First Draft

Find ways to signal that writing is crucial to research in your field and that mentoring researchers to become strong writers is a high priority for you and for your research group. When, for example, a prospective researcher interviews with you, talk about writing and your commitment to mentoring writing. If you use some form of written expectations, such as a mentoring compact, you might consider including a section for your mentees on writing. Create a culture within your group of sharing and discussing drafts and of sharing and celebrating successful writing. In your meetings or discussions, always find time to talk about writing—even long before it is time to begin writing.

Talk with trainees about their writing processes, and yours. You might read and discuss writing resources, which offer valuable advice about establishing good habits for academic writing. You might also want to share some drafts of your own research writing in progress, seeking feedback from your mentees—learning to give constructive, critical feedback helps writers grow, and sharing your drafts will give you valuable feedback and model the drafting, critique, and revision process that you are trying to teach.

Recognize that *talk* is a crucial part of writing. Be sure that you are talking regularly with trainees about their writing in progress. Your mentoring discussions about research questions, methods, literature, and results are all critical for helping a newer researcher figure out how they will explain their research project in research publications, in funding proposals, in presentations, and in interviews. In discussions, ask questions that point toward future writing, such as

"How are you thinking about organizing your literature review?"

"How might you phrase that as a research question?"

"In your results, what's new? What's most significant?"

These kinds of questions and many others help researchers clarify their thoughts through talk and help them prepare for writing. And by your choice of questions, you are helping reinforce the key principles of scientific research and helping researchers imagine the audiences for whom they will be writing.

Your trainees will benefit if you ask them to prepare and discuss the main information and arguments in their papers. Researchers benefit from having to organize information in a logical outline and giving colleagues a chance to ask questions and offer advice *before* investing hours and hours in drafting sentences and paragraphs. You might ask them to prepare and discuss informally, with you and with peers, a few PowerPoint slides outlining the main information and arguments they hope to include in their paper. Another good reason to invest time up-front clarifying key ideas and arguments: if you and your mentee do *not* clarify and agree on the main points and arguments for the paper early in the process of writing, don't be surprised if your mentee is reluctant to make major changes after she or he has invested all the time that it takes to write a full draft.

New research writers need to develop a robust understanding of the *genres* commonly written by researchers in their discipline. Strong, successful research writers can take an aerial view of a document and can talk intentionally about the purpose of a particular piece of writing and about the choices authors have made about the content and organization for a given genre. Mentors should

work systematically with mentees to identify and to analyze the key genres (or kinds of writing) in relevant fields or subfields, looking at what a particular kind of writing accomplishes and how it is tailored to a particular audience. For each key genre, mentors should first explore mentees' experience and understanding about that genre. As you have these discussions, you might want to ask trainees to analyze, together with you, the different kinds of articles in major journals in your field. In talking about genre, try to focus not on surface features of a genre (e.g., the citation system) but aim to develop—in yourself as a mentor and in your mentees—an ability to talk about the rhetoric of each genre; that is, the purpose of that genre, its audience, and its persuasive elements. For example, talk systematically about which questions get answered in the introduction, in the literature review, in the methods, in the results, and in the discussion sections. How is information organized *within* a particular section (such as the results section)? How much detail do authors give? What do the authors assume about the knowledge their readers already have about the topic under study?

Engage in "prewriting." Before your mentee begins drafting a proposal or research report, use your conversations to help your mentee plan and do what is called "prewriting." You can use your time—and your mentee's time—wisely by doing some explicit planning of a paper before your mentee starts actually drafting sections of it. Through collaborative talk and questions, you can help an author clarify the purpose of a piece of writing, central research questions, a plan, an outline, lists of main points, and the logic of an argument. Moreover, you can capture good ideas, plans, and important language—the mentee's and yours—by writing them down often as they emerge in these conversations. Your conversation and interest and encouragement also provide crucial motivation for doing the hard work of starting a writing project. And by correcting major misconceptions at this stage, you're helping writers, rather than waiting for a writer to invest countless hours in writing a full draft that may be misguided in some fundamental ways.

Set intermediate deadlines for portions of a draft, and insist that mentees meet those deadlines. Less experienced research writers need to write a partial draft long before they think they are ready to write, in order to give mentors a chance to give formative feedback and in order to give mentees plenty of time to revise. Early drafts, tough but encouraging critical feedback, and lots of revisions—these are what produce strong thinking and strong scientific writing. You might consider scheduling a weekly draft discussion for all lab members, with different members scheduled to share their work each week. It is natural for busy postdocs or graduate students to fall behind with deadlines, and of course mentors should be understanding and flexible, but you are not doing your mentees a favor if you allow them to delay writing for too long. Be sure your expectations for writing are clear and that the mentee understands the consequences of falling behind in writing given the number of publications they are expected to produce while working with you.

Ask your trainees to include a cover sheet with each draft. Each time your mentee provides you with a draft of their writing it should be accompanied by a cover sheet, which can orient you as a reader. This cover sheet might include relevant questions, such as

- What is this draft?
- Who is the intended audience?
- How is it organized?
- What are your main points?
- What do you think is working well? What are you pleased with?
- What would you especially like me to focus on as I read, or what would you like my help with?

Answers to these questions can guide your reading, and you will be able to use your time more effectively and be sure to respond to the writer's needs. Learning to reflect critically on their own writing is valuable for writers as well; experienced writers can talk effectively about their writing, can offer an aerial view of a draft, and can ask readers for particular kinds of help.

Giving Feedback and Guiding Revisions on Drafts

Encourage mentees to welcome criticism and advice about their writing. Before you ever give specific feedback on a draft, find comfortable ways to ask your mentees about their experience receiving feedback on drafts and about their feelings about feedback and criticism. Talk about your own feelings about advice and criticism and encourage your mentee to welcome and consider all feedback, to ask for clarification during an in-person conversation, and to feel comfortable choosing not to accept some advice but justifying that choice. Explain that the strongest, most successful writers seek out tough, critical readers while their writing is still changeable.

Explain your approach to feedback and contextualize your comments. For example, if you have commented only on big ideas or the next steps you are suggesting, be sure to tell that to the writer. Otherwise, it is easy for a writer to assume that because you have not commented on something that means there are no problems with it. If you commented on local concerns only in one section but similar problems continue in other parts of the draft where you did not comment, be sure to explain this lack of feedback that so that writers do not have to guess what it means.

Focus first on global concerns before local concerns. In your reading, in your comments, and in your conversations with the writer, focus first on whether the big picture is working well by addressing *global, high-level concerns* like these:

- Is the central research question clear?
- Is the significance of the research clear and persuasive?
- Is the progression of ideas and arguments logical?
- Does the writer demonstrate a clear understanding of the major concepts under study?
- Does the review of literature emphasize the most important ideas?
- Are findings clearly explained and easy to grasp—in figures and graphs as well as in the text?
- Are ideas thoroughly explained?
- Is the discussion focused on the most important points?

Later in the process of writing and revising, when the big stuff is working pretty well, narrow your focus and the writer's to more *local concerns* like these:

- Are there effective transitions between sections?
- How can the style be improved?
- Where do sentence or word problems interfere with the writer's ability to communicate clearly?
- Are there any grammatical errors?
- How can the word choice be improved?
- Are there punctuation errors?
- Are there proofreading mistakes?

Why is it important to start our feedback with global concerns? First, it is just a matter of efficiency—you have limited time to give feedback and your trainees have limited time to revise, so there is not much point to your commenting on small edits and not much point to the writer's

making small edits when the writer needs to make larger changes. Second, research shows that less experienced writers are often confused by what faculty and mentors want them to concentrate on in their writing and in their revisions. They may think, for example, that correcting semicolon mistakes or rephrasing part of a sentence is as important as clarifying the logic of their discussion or anticipating and addressing counterarguments or emphasizing some ideas and subordinating others. And mentor comments on their writing too often lead writers to make only superficial revisions to words and sentences, overlooking larger conceptual, rhetorical, and structural revisions that would most improve a paper. By starting your feedback with global concerns, mentees get clear guidance from you about how to strengthen their ideas, their analyses, and their arguments, so that they have papers worth editing and polishing. *Then* you can turn your attention—and your trainees' attention—to improving sentences, words, and punctuation.

Identify strengths and potential in a draft, teach from success, and offer encouragement. In your comments, instead of jumping right into what's wrong or needs improving, try starting with what you see as the specific strengths in a draft, what's promising, and what's working well. And it's important to make some of your praise specific, as specific as some of your criticism. So instead of saying "Good start," or just "Good," try identifying what in particular is working well in a draft. This does not mean to offer false or insincere praise, but writers need to know what they are doing well and they need to see you as a reader who is genuinely interested in what they have to say and eager for them to succeed, rather than seeing you only as an error hunter. Teaching or coaching for success means if a writer has done something well in one section of a draft (if, for example, their topic sentences orient a reader well to the topic and main point of a paragraph) but not in another section, you can encourage the writer to do what they have already done well elsewhere.

Be direct and clear in your request for revisions. When giving feedback, indicate in specific terms how much work remains to be done. For example, "This will need a fair amount of revision in order to clarify your key research questions and to report your key findings effectively. As you revise, here are my key suggestions: (1) . . . ; (2) . . . ; (3) . . . ." Or "After you've worked on focusing the literature review around just a few central concepts, you'll need to do some substantial editing to clarify sentences. I've shown the kinds of edits in the first paragraph of the lit review, but the rest of the draft needs that same kind of editing." You can be clear and constructive in your feedback, even if you are delivering bad news, but you are not doing a writer any favors if you hide or sugarcoat how much work remains to be done.

Ask writers to document their revisions. When you're reviewing a revised version of something you've read before, ask the writer to attach a cover sheet (described on pages 101–102) explaining the major changes they've made since you last read it. Asking trainees to do this signals that you expect them to make major revisions before you read something again. This kind of cover letter resembles what you would write in a cover letter or email with a revised manuscript if you received a "revise and resubmit" decision from a journal editor. In addition, you might want to ask the trainee to use "track changes" so that you can focus your reading on what's changed.

Close your comments with some encouragement and a look forward. Be sure to include notes of encouragement and expectation with your feedback. For example, you might say, "Looking forward to reading the next draft of this," or "Looking forward to seeing this in print soon!" or "Looking forward to meeting on Thursday to talk through your plans for revising."

Within your research group, create a culture that celebrates important milestones in writing. Acknowledge and celebrate proposals and manuscripts when they are submitted, when revisions are completed, grants funded, publications accepted, and publications appear.

Mentors play a critical role in helping researchers-in-training become excellent, independent writers. Be sure to set the bar high for your trainees' thinking, research, and writing and then provide them with support to meet those expectations. If at any point you feel that a mentee requires additional feedback and support, seek out local resources and encourage your mentee to take advantage of them.