

The Association of Public Health Laboratories,  
in collaboration with the United States Centers for Disease Control and Prevention's  
National Center for Immunization and Respiratory Diseases, presents

# SCIENTIFIC WRITING

## The Basics



**FACILITATOR'S GUIDE**



## About the Facilitator's Guide for Scientific Writing: The Basics

This Facilitator's Guide is a comprehensive companion to the online *Scientific Writing: The Basics* training developed by the Association of Public Health Laboratories (APHL), in collaboration with the United States Centers for Disease Control and Prevention's (CDC) National Center for Immunization and Respiratory Diseases (NCIRD). The online version of the training is accessible on the APHL website ([www.aphl.org](http://www.aphl.org)).

The guide is designed for use by facilitators for in-person training. The presentation for this training includes didactic content, activities, knowledge checks and opportunities for reflection. This guide includes case study content, knowledge checks and answers, as well as materials for facilitators like preparation support and demographic surveys.

Speaker's notes cover the content presented on screen when using the digital training presentation and provide the facilitator further information to utilize in discussions. The provided knowledge check answers ensure that facilitators can correctly identify and explain information presented through formative assessments. Interactive activities not only include those provided on screen in the digital training, but also the opportunity for the facilitator to create their own interactives, from group activities to homework.

## About APHL

APHL protects the public's health by strengthening governmental health laboratory systems in the United States and globally. Its member institutions, known as "public health laboratories," detect health hazards and generate scientific data to inform public health action.

A global leader in laboratory science, practice and policy, APHL supports member laboratories and public health partners with laboratory guidance, high-quality training, national policymaking, leadership development, crisis response and development of laboratory information management systems, among other services. Its expert staff represent diverse disciplines, from infectious disease, environmental health and food safety to newborn screening and public health preparedness. APHL membership now exceeds 800 institutions and individuals, including core laboratory members as well as federal officials, corporate partners, students and other interested parties.

More information about APHL can be found at [www.aphl.org](http://www.aphl.org), or by contacting APHL at:

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Welcome to *Scientific Writing: The Basics*. The course is designed to introduce participants to the field of scientific writing for publication. It will provide an overview of the scientific writing process, manuscript preparation and revision.

## Goal

The overall goal of this training is to introduce participants to the realm of scientific writing and encourage them to create work worthy of publication. Now more than ever, the scientific world needs diverse voices publishing on diverse topics. This training will provide the tools newcomers need to write, revise and publish scientific papers to advance their careers, their fields and the scientific community as a whole.

## Course Learning Objectives

By the end of this training, participants will be able to:

- Describe the scientific writing process and its key stages
- Demonstrate an understanding and ability to analyze and present data
- Analyze and review scientific manuscripts for key messages, consistency and justification
- Understand the importance of informal peer review and feedback

## Using this Guide

This Facilitator's Guide has three parts:

- Part I – Facilitator Orientation (**this section**)
- Part II – Course Content
  - This part includes case study content and knowledge checks for each module. The Participant's Workbook will include all presentation slides and space for notes, activities and knowledge checks.
- Part III – Surveys
  - This part includes both pre-training and post-training surveys that will help APHL improve future trainings.

The facilitator presentations are written as a script that is available as speaker notes throughout the training via the corresponding PowerPoint. Facilitation instructions and notes for the facilitator accompany the script. These notes offer guidance, alternative approaches or special considerations.

Facilitators should feel free to use their own wording and to add extemporaneous examples when appropriate. Incorporating examples from a facilitator's own life experience contributes to a richer learning experience for participants. Still, these extemporaneous additions must be balanced with time constraints.

To tailor the training to the needs of your participants, if possible, you should:

- Familiarize yourself with the entire training prior to facilitating any sessions. Although the content is scripted, you will be more confident and clearer if you are familiar with the content and can use your own wording. Feel free to mark up this guide or write notes elsewhere to help yourself prepare.
- Get to know your participants before and during the training. If possible, go over the participants' applications or sign-up information beforehand to better understand their experience, objectives and expertise. Spend time on the first day getting to know the participants in person. This can help you better tailor the training to your participants and anticipate potential questions or issues that may arise.
- Prepare materials before activities.
- This course is designed to be interactive and the training includes a variety of ways to ensure this. However, activities and content may need to be modified based on the number of participants, their expertise and other factors that may arise. Try to stay flexible.
- Simplify language, particularly technical terms and jargon, to make concepts easier to grasp. Feel free to translate concepts into local languages if you feel this would aid in understanding and make a point of focusing on those translations. Because English is the primary international scientific language, increased English proficiency will help participants thrive in scientific writing.

### **Important!**

While this training can and should be adjusted to suit the needs of participants, the specialties of facilitators and the particularities of locations, facilitators must maintain the integrity of the course content. This means that learning objectives should remain the same across all trainings. Facilitators are the best judge of participant needs, but no major sections of the training should be skipped. The agendas and timelines in this guide provide time for discussion, interaction and activities, but facilitators should keep the length of the training as a whole in mind when deciding to extend discussions, etc.

## Agenda

This course is split up into four modules. Modules 1-3 cover an overview of the scientific writing process, manuscript preparation and manuscript revision. The last module, titled “Wrapping Up,” reviews the previous modules.

The following estimates are approximations for how long each module will take to complete. By these estimates, this course can take place over 2-3 days, depending on the experience of the participants, their engagement with the course material, the pace of the facilitator, and other factors unique to each setting. True completion times will be determined by the facilitator as they familiarize themselves with both the content and the needs of their participants. Remember: each training will be different, so stay flexible.

Module	Description	Approximate Time to Complete
1	Overview of the Scientific Writing Process	1.75 hours to 2.5 hours
2	Manuscript Preparation	4 to 5 hours
3	Manuscript Revision	2.5 to 3 hours
4	Wrapping Up	1 to 1.5 hours

## Tips for the Facilitator

Facilitators for this course should be scientists or laboratorians familiar with the scientific writing process. They should have the following knowledge and skills, or knowledge and skills that complement the instruction of the scientific writing process.

Facilitators should:

- Be able to speak confidently on topics related to scientific writing
- Present research to colleagues within their organization or via oral presentation to discipline-wide audiences
- Draft sections of research manuscripts or publish as a first or senior author in journals of their discipline
- Participate formally or informally in the peer review process
- Describe the implications of research findings or direct the translation of their research findings into practice

Good facilitators:

- **Know their subject matter.** They have deeply researched their topic, which makes them well informed and credible.
- **Take the time to get to know their participants.** They demonstrate respect for and listen to the participants and call them by name, if possible.

- **Are culturally sensitive.** They are aware that their views and beliefs are shaped by their cultural background, just as the perspectives of learners are shaped by their own culture and life experiences.
- **Are lively, enthusiastic and original.** They use humor, contrasts, metaphors and suspense. They keep their listeners engaged and challenge their thinking.
- **Are inclusive.** They encourage all learners to share their experiences, questions and contribute to the group-learning process.
- **Make their remarks clear and easy to remember.** They present one idea at a time and show the relationships between ideas, summarizing when necessary.
- **Are flexible.** They read and interpret participant responses to the material and adapt training plans to meet participant needs. They are “in charge” without being overly controlling.
- **Are receptive to feedback.** They encourage co-facilitators and participants to give feedback, both informally and through formal evaluations. When they receive feedback about their performance, they critically analyze this feedback instead of becoming immediately defensive.
- **Continuously work to improve their performance and facilitation.** Even the most experienced facilitators can improve their skills. Effective facilitators seek out opportunities to learn new skills and use negative feedback as an opportunity to improve.

## Audience

This training is intended primarily for scientists who have either never published their research before, or who are intending to become a first author on upcoming publications. Participants are expected to have a working knowledge of conversational and professional English, though this may not be their first language. Publishing their work will significantly impact their professional lives and is thus of utmost importance.

## Overall Tips for Success

Facilitators should read through the entire course more than once before beginning the training. Familiarize yourself with the content of the course to make sure you understand the training goals and learning objectives for each chapter and section. The more familiar you are with the material, the easier it will be for you to focus on the participants. Preparation will help you relax and better engage your learners.

We have structured this training and this Facilitator's Guide around a digital PowerPoint presentation, which you can adapt to fit your needs. However, any adaptations will not be reflected in the prepared Participant's Workbooks and will need to be highlighted or explained to participants by the facilitator.

Because this course is centered around a digital presentation, access to reliable technology is key. The reality is, however, that sometimes projectors, screens, steady electricity and such will not always be readily available. Training can continue, or be completed entirely, without these aids. The Participant's Workbook

includes copies of all slides used in the digital training and this Facilitator's Guide includes all the information you will need to explain the content.

If you are facilitating with a partner or co-facilitator, work together to determine who will be responsible for which parts of the training. Do this by reading through the course together. If one facilitator has a specialty that aligns with part of the course content, perhaps they should be responsible for teaching that content. Perhaps one person will cover the didactic content and the other will handle activities. Perhaps one person will take Chapter 1 and Chapter 3 and the other will take Chapter 2 and the conclusion. Divide the work equally, then discuss how each facilitator can support the other while they teach.

Ways to support co-facilitators include:

- Acting as a timekeeper
- Answering individual questions without disrupting the group as a whole
- If there are technical issues, one facilitator might work on technological responsibilities while the other facilitator continues trainings
- Setting up or breaking down the location or activities

## Equipment and Supplies

The presentation for *Scientific Writing: The Basics* requires a computer, a projector that can connect to a computer and something to project onto. This could be a screen, a blank wall, a stretched piece of fabric or whatever else works. If you do not have access to a projector, finding something that participants can view easily is the next best option. Stable internet connection is recommended throughout the training.

**Hints for using a projector and computer:**

- If you do not have access to your own projector and portable computer, reserve one for your training. A training coordinator may be able to help you with this.
- Make sure your computer is equipped with compatible software to run the provided presentation. (For example, does the computer have PowerPoint?)
- You may need a portable zip or thumb drive for the presentation.
- Do a test run of the presentation using the computer well before the training begins to ensure that there are no problems during the training.

If you are unable to use the digital presentation, do not worry! The Participant's Workbook includes copies of all slides used in the digital training and this Facilitator's Guide includes all the information you will need to explain the content. However, any edits you make to the presentations will not be reflected in the Participant's Workbook.

An easily visible surface on which to write, like a chalkboard or whiteboard, may be useful. A whiteboard or chalkboard can stand in as a projector screen if need be! Writing implements, like chalk or whiteboard markers as appropriate, are also helpful.

**Helpful materials:**

- Materials for sign-in:
  - Name tags or table tents
  - Registration roster and sign-in sheet
  - Marker or bold pen for name tags
- Audiovisual equipment
  - Overhead/LCD projector (for PowerPoint presentation)
  - Computer
  - Zip or thumb drive (for presentation)
  - Prepared PowerPoint presentation
- Materials for conducting the training
  - Facilitator's Guide and notes
  - A copy of the Participant's Workbook for each participant
    - Handouts, including copies of the evaluations, are included in the Participant's Workbook
  - Pens and/or pencils for participants to use
  - A surface on which to project the presentation and write, such as a whiteboard or chalkboard (these may be two separate surfaces, one to project on and one to write on)
  - Materials to write on the surface, such as whiteboard markers or chalk
  - Extension cords

## Suggested Training Coordination Timeline

### 6-8 weeks before the event

- Identify target audience
- Identify and reserve training site
- Choose a vendor for printing or copying, if applicable
- Develop contracts and agreements with co-trainers, if applicable
- Adapt training materials so they are culturally appropriate

### 4 weeks before the event

- Develop and send invitations to participants
- Meet or confer with co-trainer(s) to coordinate roles and responsibilities, if applicable

### 3 weeks before the event

- Order and/or assemble training materials
- Reserve audiovisual equipment, if necessary
- Confirm site reservation

### 2 weeks before the event

- Check in with person handling registration with regards to the number of participants, continued availability of the facility, any changes anticipated
- Organize workbook packets with handouts, agenda, participant roster, etc.
- Prepare and assemble audiovisuals (adapting the prepared slides, any additions you feel are necessary, etc.)

### 1 week before the event

- Confirm travel arrangements, if applicable
- Confirm audiovisual reservations, if necessary
- Prepare supplies and materials for training and get them ready for travel, if necessary
- Review and rehearse training materials

### Training event

- Arrive at least 60 minutes prior to scheduled start time
- Place welcome and directional signage in the facility, if applicable
- Set up the room
- Set up and test all audiovisual equipment, including projectors, etc.
- Prepare to register participants and distribute materials
- Conduct pre-training survey and collect preliminary demographic information
- Conduct training
- Conduct daily post-training surveys, if applicable
- Conduct post-training survey after training is completed

### Immediately after the event

- Debrief with co-trainer(s), if applicable
- Celebrate!

1 week after the event

- Send thank-you notes to key people responsible for success of training
- Send pre- and post-test data, registrations and evaluations to training administrators/coordinators, if applicable
- Analyze evaluation data, complete a report of the training

3-6 months after the event

- Check in with participants to see if they are using the skills they learned, or if they need assistance or further training
- Evaluate demand/need for a new training session with new participants

## Course Content

The following pages include case study content and knowledge checks for each module. Case study content is also located in the Participant's Workbooks for participant use. Knowledge checks are likewise located in the Participant's Workbooks. Once participants complete each module, their knowledge check pages should be gathered by the facilitator for data collection, to be reported to APHL.

The correct answers are highlighted in bold text for each knowledge check below. The Participant's Workbooks do not include this information.

## Module 1: Overview of the Scientific Writing Process

### Case Study Content - Teo Barrera

#### Part 1

I am a clinical researcher, which means I'm more comfortable viewing specimens through a microscope than writing about them for a journal. Still, my team and I noticed an unusual pattern of infections transmitted from blood donations made at rural clinics. When we performed a literature review, we found plenty of articles on transfusion infections. We were surprised and excited to find that no one had written about the issue we identified in our area. Our research could improve the intake process and reduce infection risks in rural communities around the world.

My supervisor has been encouraging us to publish our findings. I have contributed to a few scientific papers, but I've never been a lead author before. I'm worried that I don't have enough experience to be a lead writer on a paper. If I'm being honest, I'm also nervous about writing the bulk of a paper in English, since it's not my first language.

#### Part 2

Asking myself questions about whether or not to write and submit a manuscript helped me discover that I truly am ready to write a scientific manuscript and publish our important findings. Now, I just need to understand the steps involved in writing a scientific manuscript.

#### Part 3

Conducting a thorough literature review is so important. My team and I read more research than we could possibly fit into our final paper, but it gave us a full background on our subject matter and confirmed that we weren't doing the same work as someone else. We limited our search to recently published papers in well-known journals, such as *The Lancet*, the *New England Journal of Medicine* and the *Journal of Hematology and Oncology*. Then, we took detailed notes on what we read, summarized what we learned and organized that information in a table that we could access later when writing the manuscript.

<b>Part 4</b>		
<b>Mr. Barrera's Research Question</b>	<b>Mr. Barrera's Main Findings</b>	<b>Key Message of Mr. Barrera's Manuscript</b>
Why are blood donations collected in rural areas of our community testing positive for high rates of transfusion-transferrable infections?	Blood donors were not disclosing infections because our screening tools did not effectively explain the need for this information. We can reduce donations of infected blood by creating new educational materials for blood donors and by making our screening tools and procedures easier to use.	Improved donor education and screening procedures may prevent blood donations that test positive for transfusion-transferrable infections.

## Module 1: Knowledge Checks

### Knowledge Check 1

Which of the following are true about scientific manuscripts?

*Select all that apply.*

- Scientific manuscripts aim to inform, not impress.
- Scientific manuscripts are essential to the evolution of modern science.
- Scientific manuscripts feature technical, clear and concise writing.
- Scientific manuscripts follow the scientific method.

### Knowledge Check 2

Which of the following are good reasons to write a scientific manuscript?

*Select all that apply.*

- When your work advances the knowledge of the field
- When your work would add new and original results or methods to the scientific conversation
- When your work has already been published
- When your work would fill a gap in existing knowledge

### Knowledge Check 3

Literature reviews are important because they...

*Select all that apply.*

- Explain the background of research on your study topic.
- Exhaustively detail every work written on your topic.
- Discover relationships between previously performed research studies and ideas.
- Identify important research themes, concepts and writers who have focused on your topic.
- Identify gaps and disagreements that your study may address.

**Knowledge Check 4**

**When should you conduct a literature review?**

*Select one answer.*

- Before conducting your study**
- After conducting your study**

**Knowledge Check 5**

**True or False?**

*Performing a literature review will make you an expert on your topic.*

- True**
- False**

**Knowledge Check 6**

**When formulating a key message, which of the following questions should you ask yourself?**

*Select all that apply.*

- What have I found that is interesting?**
- What have I found that is new?**
- What have I found that could have an impact?**

## Module 2: Manuscript Preparation

### Case Study Content – Netra Chey

#### Part 1

Staying organized and taking notes as you work will help you manage the writing process. I referred to the manuscript outline, or roadmap, many times as I wrote to add new details, make changes, or track what I was missing.

If you're working on a scientific journal article, like I am, you may already be familiar with the **IMRaD** structure. **IMRaD** is a mnemonic device that helps us remember the most important elements of a journal article, which are also part of the manuscript outline. These are the Introduction, Methods, Results and Discussion.

#### Part 2

The abstract may seem intimidating at first because it's so short, but that's actually what makes it easy. Think of writing the abstract as taking one or two sentences from each of your manuscript sections and reworking it. When you break it down, the abstract needs an introductory sentence, a sentence stating the research question, a sentence outlining your main techniques or procedures, a few sentences describing your results and one final sentence describing your major conclusion. Easy!

#### Part 3

If I think about the IMRaD method, I view the Introduction as the starting point of my journal article. This is where my team and I will introduce our problem statement and give readers enough information to fully appreciate the specific research question and objectives. Remember: the Introduction is like a funnel. It starts broad and gets narrower. Begin with the broadest scope, then get progressively more defined in your focus. This leads your reader steadily to your statement of objectives, which should be at the end of your introduction.

#### Part 4

I love data, which is why I love working on the Results section of my papers. However, it's easy to overdo it with the statistics, tables and drawings and overwhelm your readers. That's why I always devote some time to planning the most effective ways to communicate my research, both with text and with visualizations. I focus on only the most meaningful statements supported by the

evidence. I keep all text short and delete any places where my paragraphs are needlessly repeating information that readers can already find in the figures or captions. I ask myself, "Am I presenting the evidence in a logical order?" Evidence does not explain itself, so it's up to me to present the facts in the right order and explain them in a way that answers the research questions found in my Introduction.

### **Part 5**

When it's time for me to write the Discussion section, I begin by re-reading the Introduction to my manuscript. That way I can relate my results back to what I first presented in the Introduction. I can explain how my work answers my original research question, compare or contrast my findings with other published literature and describe the wider implications or areas for future exploration.

### **Part 6**

Acknowledgments are easy! Thank the people who helped you and make note of how they helped. Here is my acknowledgments section.

First, I thanked the doctors and staff of the National Institute of Hygiene and Epidemiology in Hanoi, Vietnam, because they provided most of the serum and respiratory specimens used in our study.

Next, I thanked Dr. James Luby, an expert in the isolation and propagation of human enteric coronaviruses, who provided the strains we used in our study.

I didn't thank any of my co- or sub-authors, because they get credit for writing the paper as well!

## Module 2: Knowledge Checks

### Knowledge Check 1

#### True or False?

*The abstract is a simple summary of your manuscript.*

- True
- False**

### Knowledge Check 2

#### How should the methods section be organized?

*Select one answer.*

- Alphabetically
- Chronologically**
- Thematically
- Whatever way seems easiest

### Knowledge Check 3

#### What is p-hacking? Choose the correct definition.

*Select one answer.*

- Methods of breaching the defenses and exploiting the weaknesses of a computer system or network.
- When researchers misuse their results by analyzing data in multiple ways or multiple times until they get their desired result.**

### Knowledge Check 4

#### What graph types would you use if you were comparing values?

*Select all that apply.*

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> <b>Column</b> | <input type="checkbox"/> Line                        |
| <input type="checkbox"/> Stacked Bar              | <input type="checkbox"/> Dual-Axis Line              |
| <input checked="" type="checkbox"/> <b>Bar</b>    | <input checked="" type="checkbox"/> <b>Histogram</b> |
| <input checked="" type="checkbox"/> <b>Line</b>   | <input type="checkbox"/> Scatter Plot                |

**Knowledge Check 5**

**What graph types would you use if you were analyzing trends in data?**

*Select all that apply.*

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> <b>Dual-Axis Line</b> | <input checked="" type="checkbox"/> <b>Column</b> |
| <input type="checkbox"/> <b>Scatter Plot</b>              | <input type="checkbox"/> <b>Stacked Bar</b>       |
| <input checked="" type="checkbox"/> <b>Line</b>           |   |

**Knowledge Check 6**

**Using the examples below, choose which one is the more appropriate way to conclude your Discussion.**

*Select one answer.*

- We found that providing a Session Zero was feasible in our setting and appeared to contribute to the success of the lifestyle change program.
- Our study proves that providing a Session Zero is feasible and effective.**

**Knowledge Check 7**

**Using the examples below, choose which one is the more appropriate way to conclude your Discussion.**

*Select one answer.*

- There was no difference in weight loss between participants enrolled based on a risk test only and those with a blood test diagnosis of prediabetes.**
- The difference between participants enrolled based on a risk test only and those enrolled based on a blood test diagnosis or prediabetes did not reach statistical significance at the p-.05 level.

## Module 3: Manuscript Revision

### Case Study Content – Dr. Sara El-Tenobi

#### Part 1

Finishing my fellowship doesn't mean I've finished writing my manuscript on locating and accessing health data. Coming home has been wonderful, but I haven't been working much on my manuscript. Between writer's block, too much data and burnout, I have experienced many of the issues one faces when writing a manuscript. I want my writing to be perfect but putting that pressure on myself makes it so difficult to write at all. When I get stuck, I return to my outlines or notes and remind myself of the "worst possible draft." I write the worst version of what I'm working on and let it stay that way until my next revision.

#### Part 2

Technically, my paper is written, but an unrevised article is nowhere near complete. It may sound strange, but to prepare for the revision process, I am doing a lot of reading.

Each week, I read at least two scientific papers, sometimes more. I take my time, read carefully and pay attention to what I like and don't like about the writing, presentation and style of each paper. Analyzing other articles helps me to better analyze my manuscript.

This reading and analysis also help me practice English, which is not my first language. I have asked some of my professors and colleagues to read and edit my manuscript, but I have to finish a good draft before I am ready for them to see it.

## Module 3: Knowledge Checks

### Knowledge Check 1

**Use verbs, not nouns, to express crucial actions.**  
*Select the correct way to express crucial actions below.*

- Demonstration of progress made by laboratories is done through improvement project data.
- Laboratories demonstrate their progress through improvement project data.**

### Knowledge Check 2

**Use verbs, not nouns, to express crucial actions.**  
*Select the correct way to express crucial actions below.*

- Researchers investigated the epidemic.**
- Researchers conducted an investigation into the epidemic.

### Knowledge Check 3

**Which of the following examples uses the most effective scientific voice?**  
*Select one answer.*

- It is well known that inadequate maternal nutrition can lead to compromised pregnancies.
  - Potential rewrite in an effective scientific voice:** *Inadequate maternal nutrition can compromise pregnancies.*
- The aim of this study was to assess the causes of severe lipemia and to better define the relationship between lipemia and hemolysis.**
- We thought it could be important to promote quality practices in the mycobacteriology laboratory.
  - Potential rewrite in an effective scientific voice:** *Promoting quality practices in the mycobacteriology laboratory is essential.*
- This study deals with diagnostic principles and procedures for Mycobacterium tuberculosis.
  - Potential rewrite in an effective scientific voice:** *The study addresses diagnostic principles and procedures for Mycobacterium tuberculosis.*

**Knowledge Check 4**

**Some helpful ways to address writing issues are...**

*Select all that apply.*

- Setting aside dedicated time for writing**
- Making deadlines and sticking to them**
- Adding unnecessary data to the paper
- Returning to the outline and using bullet points, sentence fragments, or notes to push ahead**
- Refusing to ask for help
- Allowing yourself to create a “worst possible draft” rather than trying to achieve perfection the first time around**
- Working straight from a study protocol**
- Waiting until the last moment to write

**Knowledge Check 5**

**What qualifies someone as an author or co-author on a scientific manuscript?**

*Select all that apply.*

- They are the director of your institution.
- They have significantly contributed to the concept/design or analysis/interpretation of data or acquisition of data.**
- They financially contributed to the study.
- They have significantly contributed to drafting the manuscript or they performed critical revisions.**
- They are your boss.
- They have approved the manuscript for publication.**
- They are a departmental supervisor.

### Knowledge Check 6

#### True or False?

You *must* write your Introduction first, then the Methods section, then the Results section and finally the Discussion. This is the *only* approach you may take to writing.

- True
- False**

### Knowledge Check 7

#### Keep your writing simple! Which sentences are appropriately concise?

*Select all that apply.*

- While it is no secret that pathogenic bacteria are able to develop antibiotic resistant variants, a less well-appreciated fact is that a small number of bacteria, including some of nature's nastiest pathogens, can resist antibiotics and escape antibiotic treatments without relying on variants.
- ✓ **Potential rewritten sentence:** *Some bacterial populations can exhibit antibiotic resistance without relying on variants.*
- Many diseases can cause bone marrow failure, resulting in greatly reduced to absent hematopoiesis with subsequent pancytopenia.**
- An in-house-developed enzyme-linked immunosorbent assay was used for determining plasma IgG antibodies against p16-derived antigens in 122 HCC patients and 134 healthy controls.**
- Tape-lifting is a very useful and surprisingly non-destructive alternative to swabbing when you have to collect any biological materials deposited on surfaces, especially on porous substrates like paper, untreated wood, cardboard, sponge and fabric.
- ✓ **Potential rewritten sentence:** *Tape-lifting is a non-destructive alternative to swabbing for collection of biological materials deposited on surfaces, especially on porous substrates.*

**Knowledge Check 8**

**Which of the following are the standard sections of peer review feedback?**

*Select all that apply.*

- Summary of the research**
- Criticisms of the author
- Major and minor issues**
- Other points**
- Reviewer's overall feedback**

**Knowledge Check 9**

**Which of the following are ways to be a good reviewer?**

*Select all that apply.*

- Closely read a variety of scientific papers.**
- Be mindful of deadlines.**
- Do not read review guidelines
- Join a writing critique group.**
- Only review papers if absolutely necessary.
- Give only general feedback.

## Module 4: Wrapping Up

### Module 1 - Review 1

Which of the following options best completes this sentence?

*Scientific writing is \_\_\_\_\_ writing.*

- general
- technical**
- impressive
- unreviewed

### Module 1 - Review 2

Which of the following reasons support your writing a scientific manuscript?

*Select all that apply.*

- My study fills a gap in existing knowledge.**
- My work has already been published in other journals.
- My work takes a leap into new territory.**
- My work explores well known studies, but tests a new method or approach.**
- My work is only interesting to my intended audience.**

### Module 1 - Review 3

**True or False?**

The abstract distills your entire paper down to one simple sentence.

- True
- False**

**Module 2 - Review 1**

**What is the most frequently read part of any scientific paper?**

*Select one answer.*

- Title**
- Abstract
- Introduction
- Methods
- Results
- Discussion

**Module 2 - Review 2**

**Which section of the manuscript do many scientists write first?**

*Select one answer.*

- Title
- Abstract
- Introduction
- Methods
- Results**
- Discussion

**Module 2 - Review 3**

**You should evaluate the results of your study in which section of the manuscript?**

*Select one answer.*

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussion**

**Module 3 - Review 1**

**Which of the following activities may help improve your editing skills?**

*Select all that apply.*

- Taking a break from reading scientific articles so they won't influence your writing
- Joining a journal club or writing group where you can read and critique others' work**
- Rejecting requests to review your colleagues' work so you can focus on your own manuscript
- Taking English lessons or using language apps to practice good grammar, fluency and comprehension**
- Ignoring multiple reviewers' suggestions to change a particular section in your manuscript

**Module 3 - Review 2**

**How should you handle acronyms in your scientific manuscript?**

*Select one answer.*

- Don't include acronyms in your scientific manuscript. Write everything out so you won't confuse the reader.
- Use acronyms as much as possible to make your paper easier to read.
- Use acronyms consistently and define each acronym in its first instance.**

**Module 3 - Review 3**

**What is the recommended writing style to adopt when writing a scientific manuscript?**

*Select one answer.*

- APA Style
- The writing style of your target publication**
- American English
- British English

## Surveys

The following surveys are intended to collect measurable participant data and should be submitted to APHL once trainings are complete.

The first survey is a Pre-Training Survey for Participants. There is one copy of this survey in each Participant Workbook. Please direct all participants to fill out the survey before training officially begins! You could have them fill it out after laying out the ground rules and getting to know the group. Survey results must be shared with APHL after training is completed.

The Pre-Training and Post-Training Surveys for Participants, found on the pages titled “evaluations,” are for your development as a facilitator. If you choose, you may have participants fill out a survey for each day of training and use the information to improve facilitation and focus of current and future trainings. While three days’ worth of evaluations are provided here, you may use as many or as few as you choose.

The last survey is the Post-Training Participant Survey. It must be completed after finishing the training, but before participants disperse. The information collected must be shared with APHL after training is completed.

## Pre-Training Survey for Participants

Before you begin the training, please complete a brief survey. Your responses will not be graded. Instead, your responses will help us make future enhancements to the training.

### A. Demographic Information

1. Where is this training located?
  - a. North America
  - b. Central America
  - c. South America
  - d. Europe
  - e. Africa
  - f. Asia
  - g. Australia
  - h. Caribbean Islands
  - i. Pacific Islands
  - j. Other (Please specify): \_\_\_\_\_
  - k. Prefer not to say
  
2. What is the primary language you use in the workplace?
  - a. English
  - b. Spanish
  - c. Portuguese
  - d. French
  - e. Mandarin
  - f. Arabic
  - g. Other (Please specify): \_\_\_\_\_
  
3. Which of the following best describes your primary profession? Select all that apply.
  - a. I am a laboratory technician.
  - b. I am a laboratory manager/supervisor.
  - c. I am a laboratory director.
  - d. I am an epidemiologist.
  - e. I work in research or academia.
  - f. I work for the health ministry (non-lab work).
  - g. Other (Please specify): \_\_\_\_\_
  
4. What is the highest degree or level of education you have completed?
  - a. High School/Secondary School
  - b. Some college credit, no degree
  - c. Bachelor's Degree (or equivalent)
  - d. Master's Degree (MS, MPH, MA, etc.)
  - e. Professional Degree (MD, PharmD, DO, etc.)
  - f. Doctorate Degree (PhD, PsyD, EdD, etc.)
  - g. Other (Please specify): \_\_\_\_\_

### B. Scientific Manuscript Writing Experience

1. Have you published a scientific manuscript prior to taking this training?
  - a. Yes, I have served as first author on one or more papers published in a peer-reviewed journal.
  - b. Yes, I have served as a second author or other co-author on one or more papers published in a peer reviewed journal, but I have not yet been a first author.
  - c. Not yet, but my manuscript has been submitted to a peer-reviewed journal for review and publication.
  - d. Not yet; my manuscript is currently in progress.
  - e. No, I have not yet started writing my manuscript.
  - f. Other (Please specify): \_\_\_\_\_

2. Have you had previous scientific manuscript writing training? Select all that apply.
  - a. Yes, collegiate or graduate coursework.
  - b. Yes, coursework or professional training taken courtesy of my employer.
  - c. Yes, coursework or professional training taken independent of my employer.
  - d. Yes, I've received informal training through peer mentorship, journal clubs or similar support.
  - e. No, I have not had any scientific manuscript training experience.
  - f. Other (Please specify): \_\_\_\_\_
  
3. How confident do you feel about your ability to write and submit a scientific manuscript for peer-reviewed journal publication?
  - a. Very confident
  - b. Fairly confident
  - c. Somewhat confident
  - d. Slightly confident
  - e. Not confident at all

### **C. Course Learning Objectives**

The following questions will help gain insight into what you are hoping to learn from this online training course. Please feel free to add additional comments at the end of the survey.

1. What is your primary reason for taking this course? Select all that apply.
  - a. To understand the basics of the scientific manuscript writing process
  - b. To understand the purpose and structure of each of the sections in a scientific manuscript
  - c. To understand how to analyze and present data
  - d. To understand how to analyze and review scientific manuscripts
  - e. Other (Please specify): \_\_\_\_\_

2. Please rate the following learning objectives in order of importance, as they relate to your reasons for taking this course.

	Not important	Somewhat important	Important	Very important
Describe the scientific writing process and its key stages.				
Describe the purpose and structure of each of the sections in a scientific article.				
Demonstrate an ability to present data.				
Analyze and review scientific manuscripts for key messages, consistency and justification.				
Understand the importance of informal peer review and feedback.				

3. What do you hope to do or achieve after completing this training course?

## Evaluations

### Evaluation and learning sheet: Day 1

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. There was enough time devoted to today's topic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The facilitator effectively conveyed key messages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The materials were easy to understand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The content helped me reflect on my work as a scientist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I was satisfied with this session.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

**Evaluation and learning sheet: Day 2**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. There was enough time devoted to today's topic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The facilitator effectively conveyed key messages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The materials were easy to understand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The content helped me reflect on my work as a scientist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I was satisfied with this session.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

**Evaluation and learning sheet: Day 3**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. There was enough time devoted to today's topic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The facilitator effectively conveyed key messages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The materials were easy to understand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The content helped me reflect on my work as a scientist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I was satisfied with this session.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

## Post-Training Participant Survey

Thank you for your dedication to improving your skills and knowledge related to scientific writing! Now that you have completed this training, please complete the survey on the following slides. Your responses will not be graded. Instead, your responses will help us make future enhancements to the training.

### A. Overall Experience

1. Please rate your overall experience with this training:
  - a. Excellent
  - b. Good
  - c. Satisfactory
  - d. Poor
  - e. Very poor
  
2. The table below lists the course learning objectives. Do you feel confident that you achieved these objectives? Please rate your confidence level for each objective.

	Not confident	Somewhat confident	Confident	Very confident
Describe the scientific writing process and its key stages.				
Describe the purpose and structure of each of the sections in a scientific article.				
Demonstrate an ability to present data.				
Analyze and review scientific manuscripts for key messages, consistency and justification.				
Understand the importance of informal peer review and feedback.				

3. After completing this course, how confident do you feel about writing and submitting a scientific manuscript for peer-reviewed journal publication?
  - a. Very confident
  - b. Fairly confident
  - c. Somewhat confident
  - d. Slightly confident
  - e. Not confident at all

4. When it comes to learning how to write a scientific manuscript, are there any topics missing from the training that you would like to learn about? If yes, please describe on the next page.

5. Mark the extent to which you agree or disagree with the statements in the table below.

	Strongly disagree	Disagree	Agree	Strongly agree
The level of the material was appropriate for my background.				
Much of the content covered was new information to me.				
I will utilize the information and techniques presented in the training.				
Overall, the course was worth the time I spent to take it.				
The teaching strategies were effective.				

6. Would you recommend this course to others?
- a. Yes
  - b. No
7. Are there any additional comments or feedback that you would like to share?

