**Learning Objectives for Science Writing / Communication**

There are a number of different categories of science writing/communication (such as academic and journalistic), and different skills are required for a certain proficiency in each. As a result, you may wish to design courses and their components to incorporate specific learning objectives, many of which appear in category-specific lists in this resource.

To distinguish between the different types of objectives, we have divided these up by category and then by their location within Bloom’s taxonomy.

**General science communication:**

***Knowledge***

Identify, and restate in your own words, the thesis statement in a piece of writing

Define the different types of plagiarism and avoid plagiarism

Identify different audiences of scientific information

Recognize when it is appropriate to use the different types of scientific literature such as primary literature, reviews, and textbooks

Know that there are many different, commonly used citation styles, and that these can be managed with a citation manager such as RefWorks

***Understand***

Discuss reasons scientists communicate (or should communicate) their work

Discuss the role of governments, industry, and other stakeholders in communicating science

Explain how scientific research is published (including the peer review process, open-access journals, and the embargo system)

Identify some common misconceptions of science

Explain what is at stake if scientific research/information is communicated poorly

***Apply***

Apply writing best practices regarding: clarity, succinct writing, topic sentences and paragraph structure, passive vs. active voice, metaphors, jargon

Avoid committing the different types of plagiarism in science writing

Locate relevant information in scientific publications

Apply different citation styles using citation manager software such as RefWorks

***Analyze***

Explain what is done well (and what isn’t) in examples of different styles of science writing

***Evaluate***

Give feedback on peers' writing

Decide what aspects of peer feedback to incorporate into your writing

Evaluate sources of scientific information possible origins of scientific misconceptions and how they might be addressed

***Create***

Organize scientific information from a variety of sources to produce different written work (research papers, essays, journalistic articles, blog posts etc.

**Academic science communication:**

***Knowledge***

Label the components of a scientific paper (IMRAD: intro, methods, results, and discussion)

Decide when it is appropriate to use the different types of scientific literature such as primary literature, reviews and textbooks

Identify the elements of an argument, claim and the interpretation of evidence that supports the claim

Identify thesis and development statements

***Understand***

Explain how scientific research is published (including the peer review process, open-access journals, and the embargo system)

***Apply***

Use online research tools (e.g. databases, e-journals, Google Scholar, Web of Science) to collect relevant information (e.g. scholarly articles, websites, blog posts) on a particular topic

Cite different types of scientific literature appropriately

Use an outline to organize a scientific argument with a claim and supporting evidence

***Evaluate***

Read scientific literature and assess the quality of the claims and evidence used to support them

Defend the validity of an argument by evaluating evidence in a variety of genres, including popular media, websites and scientific journals

***Create***

Write a scientific paper using the IMRAD structure

Write an argumentative essay using claims and evidence supported by scientific literature

**Journalistic science communication, multimedia integration, and using digital tools**

***Knowledge***

Define the characteristics of newsworthiness

Identify use of the inverted pyramid structure in journalistic writing

Identify the characteristics of a good opening paragraph (lead) --who, what, where, when, why, how

Recognize the role of the public affairs or communications offices in communicating science

***Understand***

Recognize the needs and limitations of people working in the media

Recognize, as scientists, that complexity must be sacrificed for clarity in some cases

Explain why it is important to use quotations more frequently than in academic science communication

***Apply***

Apply the inverted pyramid structure when writing press releases or journalistic articles

Use appropriate, interesting quotations when writing in journalistic style

***Evaluate***

Critically discuss the historical “two cultures” of science and journalism

Critically discuss how science communication is changing (online news, social media, citizen journalism, blogging, etc.) and how this affects the work of journalists, press officers, and other members of the media

Critically discuss how science communication is changing (online news, social media, citizen journalism, blogging, etc.) and how this affects the work of scientists

Critically examine best practice examples of science podcasts and videos

***Create***

Write a lead for an article about science that is intended for a non-expert audience

Write a blog post about scientific research in journalistic style (max 500 words) for a non-expert audience

Construct a production plan for a multimedia project that reports on a current piece of scientific research

Conduct an on-camera interview with a researcher

Create detailed scripts, including narration and shot lists, for a short video and podcast based on an interview with a researcher

Produce a short podcast about a current piece of scientific research

Produce a short video about a current piece of scientific research

Contribute posts and comments to the course blog

**Scientific presentations, and visual materials:**

***Knowledge***

Identify the appropriate amount – and type – of content

***Understand***

Identify key points from a presentation

Describe the most common practices for visually reporting statistical and other scientific information

***Apply***

Apply oral presentation best practices: eye contact, pace, gesture, content, visual aids, rehearsing

When appropriate, incorporate presentation techniques such as humour, metaphor, comparisons, and analogies

Incorporate graphics and multimedia elements into presentations

Represent data in logical and clear tables and graphs

***Analyze***

Analyze risk communication in the context of scientific data and non-expert audiences

***Evaluate***

Ask and answer questions after viewing presentations

Evaluate visual representations of scientific information

Evaluate the reporting of statistical ideas

***Create***

Deliver an oral presentation using no visual aids (a speech) that is clear, audible, well rehearsed, and suitable for the audience

Deliver an oral presentation using visual aids (a speech) that is clear, audible, well rehearsed, and suitable for the audience

Deliver a presentation using software (such as PowerPoint, Keynote, Prezi) that is clear, audible, well rehearsed, and suitable for the audience