Assignment Option One: Make a Written Piece

Throughout this lesson you have explored how scientists use visual spectrograms of sound to better understand what is happening in a recording. By using both the sound we hear and the sound we can see, researchers glean more information from hydrophones than using the recorded sound alone. Using what you know, or additional information from a variety of sources, create a written piece (such as a speech, essay, or report) to show what you know. Explore the following:

Once researchers have spectrograms, is it necessary to have the sound recording as well? Is it possible to analyze what is happening with just the images of the sound alone? Why, or why not?

Include the answers to the following questions in your assignment:

- What are spectrograms, and what are the key features of the image?
- What might a spectrogram reveal to researchers? Include a few examples.
- What might listening to a sound reveal that can't be seen in a spectrogram and vice versa?
- Can a researcher use one form alone? Why or why not?

Criteria:	4	3	2	1
Defines spectrograms and key features of a spectrogram.	Clearly explains a spectrogram, noting key features of the image.	Mostly explains a spectrogram and notes most key features of the image.	Does not completely explain a spectrogram and misses key features of the image.	Does not explain a spectrogram.
Provides examples of what spectrograms can reveal to researchers.	Provides relevant examples of what spectro-grams and listening can reveal to researchers.	Provides limited examples of what spectrograms and listening can reveal to researchers.	Provides only one example of what either spectrograms or listening reveals to researchers.	Does not provide examples for either listening or spectrograms.
Discussion is engaging and explores multiple perspectives and ideas on listening and viewing.	Discussion is engaging and acknowledges multiple perspectives and ideas on listening and viewing while taking a firm stance.	Discussion is engaging, but some perspectives are missing on listening vs. viewing, though the writer takes a firm stance.	Discussion is present though not engaging, important perspectives are missing.	Discussion is neither engaging, nor does it address other perspectives.
Piece has been proofread for spelling, grammar, and accuracy, and includes name, date, and title.	No mistakes.	1-2 mistakes.	2-4 mistakes.	Many mistakes are evident.

Lesson D: Visual Representations of Sound

Assignment Option Two: Make a Media Presentation

Throughout this lesson you have explored how scientists use visual spectrograms of sound to better understand what is happening in a recording. By using both the sound we hear and the sound we can see, researchers glean more information from hydrophones than using the recorded sound alone. Using what you know, or additional information from a variety of sources, create a media piece (such as a poster, Prezi, PowerPoint, Glogster, or other) that explores the following issue:

Create a visual comparison of waveform, spectrograph data, and audio data. What are the key features of each that help researchers understand what they are hearing?

Be sure to include answers to the following questions in your assignment:

- What is waveform data? What does it look like and how is it helpful?
- What is spectrogram data? What does it look like and how is it helpful to researchers?
- What can we learn from visual data that we might struggle to learn through audio alone?
- Provide examples of each type (Exception: audio example not required on a print poster).
- Explore: What is the value in using visual and audio data together?

Criteria:	4	3	2	1
Explains or demonstrates the three different ways of exploring the data.	Covers key components of all data outputs, showing a thorough under-standing of how the data helps researchers.	Mostly covers key components of each type of data, and shows a good under-standing of how the data helps researchers.	Some key elements of each are missing, and only briefly touch on how each helps researchers.	Major elements are missing and it does not mention how any data output helps researchers.
Provides at least three examples of visual data enhancing what can be learned from audio data.	Mentions three or more relevant, clear examples that lead the reader to a better understanding of visual data.	Mentions less than three relevant examples that help the reader shape a better understanding of visual data.	Provides one example that might help the reader understand visual data.	Does not provide examples, or examples are irrelevant and/or confusing.
Accurately discusses the value of using data together.	Clearly defines and addresses advantages and disadvantages of both types of data together.	Touches on most advantages and disadvantages of both types of data together.	Touches on some but not all of the advantages and disadvantages of both types of data together.	Misses key features of the discussion and both types of data.
Project has been proofread for spelling, grammar, and accuracy, and includes name, date, and title.	No mistakes.	1-2 mistakes.	2-4 mistakes.	Many mistakes are evident.

Assignment Option Three: Take on a Role

Throughout this lesson you have explored how scientists use visual spectrograms of sound to better understand what is happening in a recording. By using both the sound we hear and the sound we can see, researchers glean more information from hydrophones than using the recorded sound alone. Using what you know, or additional information from a variety of sources create a presentation (speech, character role, PowerPoint, debate, or discussion) of the following:

Take on the role of a scientist: As a marine biologist, how does spectrograph and waveform data inform your practice and enhance your understanding of noise in the ocean?

In your presentation, be sure to include:

- An introduction as to who you are, and how listening and viewing sound data can help you understand sounds in the ocean.
- Provide an example of how seeing and hearing sound has helped you better understand something about the marine environment. (Note to students: You may create examples that are fictional.)
- Discuss some pros and cons of each. Could you complete your research if you only had one form of data? Why or why not?

Criteria:	4	3	2	1
Student introduces him or herself and explains how listening and viewing can help him or her.	Role is defined, and clearly explains how listening and viewing sound enhances his or her practice.	Role is mostly defined and mostly explains how listening and viewing enhances his or her practice.	Role or the value of listening and viewing is not clear, though it is implied.	Role and the value of listening and viewing is not clear.
Accurately discusses the pros and cons of each type.	Thoroughly discusses the pros and cons of each.	Mostly discusses the pros and cons of each.	Almost explores the pros and cons of each.	Does not explore pros and cons, or provides only one side of the issue.
Provides at least three examples of how seeing and hearing a sound has provided better understanding about the marine environment.	Mentions three or more relevant, clear examples that help the audience understand the value of each.	Mentions fewer than three relevant examples but still helps to shape the audience's understanding of the value of each.	Provides one example that might help the audience understand the value of one type.	Does not provide examples or examples are irrelevant and/or confusing.