**Sound Lesson Plan: Bird Song Hero**

Grade Levels: 4-8

**Student-Facing Description:**

Listen up and become a Bird Song Hero. Amaze your friends with the power to name the species of birds that are singing (even when you can’t see them).

**Teacher Description:**

Bird Song Hero hones student observational skills by harnessing the power of the visual brain to help players identify the unique qualities of each bird song. This kind of multisensory practice is recommended for sharpening science, math, and music skills. By building bird identification skills, Bird Song Hero also provides a new way for students to connect with the natural world.

**Students will:**

1. Learn about sound, pitch, and duration
2. Learn how spectrograms reflect pitch and duration
3. Listen to bird songs and correctly match them with their respective spectrograms
4. Define the x- and y-axes of a spectrogram
5. Create their own spectrograms to represent songs they hear

**Materials:**

* Whiteboard
* Individual computers for students to use
* Internet access for BrainPOP
* Pencils and paper

**Vocabulary:**

Sound, duration, pitch, spectrogram

**Preparation:**

Background information:

There are almost 10,000 species of bird in the world. Each species has its own unique set of vocalizations—some beautiful, some harsh, and some quite humorous. If you can learn those songs, you can identify what birds are around you even if you can’t see them. In Bird Song Hero, you are presented with colorful sound visualizations called spectrograms.

Bird songs can span more pitches than a piano in just a tenth of a second. You can visualize these changes through spectrograms. Spectrograms are like graphs. You see time from left to right on the x-axis, and pitch from low to high on the y-axis. The longer the line is, the longer the duration of the note or phrase of the song. The brighter the line is, the louder. Spectrograms stimulate the visual part of our brain to help us appreciate birds as vocal geniuses and commit song patterns to memory. That’s why many birders use them as they learn to identify birds.

For a more in-depth tutorial, you can check out [**Bird Song Hero training video**](https://academy.allaboutbirds.org/features/bird-song-hero/bird-song-hero-tutorial), provided by The Cornell Lab of Ornithology’s Bird Academy website. This video gives you a short introduction to spectrograms and instructions on playing the game.

**Lesson Procedure:**

1. Play Bird Song Hero:
	1. Play each song as many times as students need, encouraging them to listen closely for patterns.
	2. When students are ready, pick the matching sound visualization, or spectrogram.
	3. Explore the other spectrogram options so you can train your brain to see and hear the differences.
	4. Finish the level to see your score and move on to the Ultimate round.
2. Practice creating and sounding out spectrograms:
	1. On a whiteboard, draw x- and y-axes. Explain that these are parts of a graph and represent information that is important for understanding a spectrogram. Introduce the x- and y-axes, making sure that students understand that time is measured in the x-axis and pitch on the y-axis.
	2. Draw a simple spectrogram and put it on display for students to see. Be sure to include descending or ascending lines of different lengths. Explain that the different lengths of line indicated the duration of the note or phrase.
	3. Sound out the spectrogram with your students by whistling or humming. Emphasize the higher or lower pitches and the short or drawn-out notes. Have students sound out the spectrogram as a class or ask for a few volunteers. If the students are struggling with a certain part of the spectrogram, take time to review what each of the axes represents focusing on that portion of the spectrogram. Have the students sound out the complete spectrogram again.
	4. Divide students into groups of two. Explain that each student will create their own simple spectrogram for their partner to sound out. Allow students time to create and sound out each other’s spectrograms.
	5. Explain that the students will now whistle or hum a very short song for which their partner will draw the spectrogram. Instruct students to label their axes.
	6. Have each group share their favorite song and spectrogram and discuss which was the trickiest part and why. Encourage them to use the terms pitch and duration in their explanations.
3. Write or project the following questions for discussion or writing prompts:
	1. How is a spectrogram similar to a musical score?
	2. Is bird song music? Why or why not?
	3. What can you learn from a spectrogram that is different from only listening to a song?

**Extension Activities:**

[**The Cornell Lab of Ornithology**](http://birds.cornell.edu)has many resourcesto help you teach and learn about birds, get involved with citizen science, and help protect our planet.

To further develop spectrogram literacy, encourage your students to draw a spectrogram of an actual bird song audio clip from the Cornell Lab’s [**Macaulay Library**](http://macaulaylibrary.org/search-help) website.

Explore bird song by discovering what birds are communicating when they sing. Download The Cornell Lab’s BirdSleuth K-12 program’s free [***Bird Communication***](http://www.birdsleuth.org/communication/) curriculum, complete with six dynamic activities. You and your students will investigate why and how birds communicate and learn to appreciate the songs you hear everyday. For more [**lesson plans**](http://www.birdsleuth.org/aabb-sound-lessons/), make sure to visit the [**BirdSleuth**](http://www.birdsleuth.org) website and check out their [**free resources**](http://www.birdsleuth.org/free-resources/) for educators.

Browse the free media library on the Cornell Lab’s [**Bird Academy**](https://academy.allaboutbirds.org/media-library/) website to find free videos, interactives, and games to help students learn about biology through the colorful lives of birds.

**[Lesson Plan Common Core State Standards Alignments](http://educators.brainpop.com/lesson-plan/lure-of-the-labyrinth-vending-machine-puzzles-mathematical-concepts/?bp-game=lure-of-the-labyrinth-employee-lounge" \l "alignment-list-21648)**

**Grade: 04**

[**CCSS.ELA-LITERACY.CCRA.SL.4**](http://www.corestandards.org/ELA-Literacy/CCRA/SL/4/)
Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

[**CCSS.ELA-LITERACY.SL.4.1**](http://www.corestandards.org/ELA-Literacy/SL/4/1/)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

[**CCSS.ELA-LITERACY.L.4.1**](http://www.corestandards.org/ELA-Literacy/L/4/1/)
Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[**CCSS.ELA-LITERACY.L.4.3**](http://www.corestandards.org/ELA-Literacy/L/4/3/)
Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[**CCSS.ELA-LITERACY.L.4.6**](http://www.corestandards.org/ELA-Literacy/L/4/6/)
Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

**Grade: 05**

[**CCSS.MATH.CONTENT.5.G.A.2**](http://www.corestandards.org/Math/Content/5/G/A/2/)
Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

[**CCSS.ELA-LITERACY.SL.5.1**](http://www.corestandards.org/ELA-Literacy/SL/5/1/)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

[**CCSS.ELA-LITERACY.SL.5.2**](http://www.corestandards.org/ELA-Literacy/SL/5/2/)
Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

[**CCSS.ELA-LITERACY.L.5.1**](http://www.corestandards.org/ELA-Literacy/L/5/1/)
Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[**CCSS.ELA-LITERACY.L.5.3**](http://www.corestandards.org/ELA-Literacy/L/5/3/)
Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[**CCSS.ELA-LITERACY.L.5.6**](http://www.corestandards.org/ELA-Literacy/L/5/6/)
Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships

**Grade: 06**

[**CCSS.ELA-LITERACY.SL.6.1**](http://www.corestandards.org/ELA-Literacy/SL/6/1/)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

[**CCSS.ELA-LITERACY.SL.6.2**](http://www.corestandards.org/ELA-Literacy/SL/6/2/)
Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

[**CCSS.ELA-LITERACY.SL.6.6**](http://www.corestandards.org/ELA-Literacy/SL/6/6/)
Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

[**CCSS.ELA-LITERACY.L.6.1**](http://www.corestandards.org/ELA-Literacy/L/6/1/)
Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[**CCSS.ELA-LITERACY.L.6.3**](http://www.corestandards.org/ELA-Literacy/L/6/3/)
Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[**CCSS.ELA-LITERACY.L.6.6**](http://www.corestandards.org/ELA-Literacy/L/6/6/)
Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**Grade: 07**
[**CCSS.MATH.CONTENT.7.RP.A.2**](http://www.corestandards.org/Math/Content/7/RP/A/2/)
Recognize and represent proportional relationships between quantities.

[**CCSS.ELA-LITERACY.SL.7.1**](http://www.corestandards.org/ELA-Literacy/SL/7/1/)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

[**CCSS.ELA-LITERACY.SL.7.2**](http://www.corestandards.org/ELA-Literacy/SL/7/2/)
Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

[**CCSS.ELA-LITERACY.SL.7.6**](http://www.corestandards.org/ELA-Literacy/SL/7/6/)
Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

[**CCSS.ELA-LITERACY.L.7.1**](http://www.corestandards.org/ELA-Literacy/L/7/1/)
Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[**CCSS.ELA-LITERACY.L.7.3**](http://www.corestandards.org/ELA-Literacy/L/7/3/)
Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[**CCSS.ELA-LITERACY.L.7.6**](http://www.corestandards.org/ELA-Literacy/L/7/6/)
Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**Grade: 08**
[**CCSS.MATH.CONTENT.8.F.B.4**](http://www.corestandards.org/Math/Content/8/F/B/4/)
Construct a function to model a linear relationship between two quantities. Determine the rate of change  and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

[**CCSS.MATH.CONTENT.8.F.B.5**](http://www.corestandards.org/Math/Content/8/F/B/5/)
Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

[**CCSS.ELA-LITERACY.SL.8.1**](http://www.corestandards.org/ELA-Literacy/SL/8/1/)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

[**CCSS.ELA-LITERACY.SL.8.2**](http://www.corestandards.org/ELA-Literacy/SL/8/2/)
Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

[**CCSS.ELA-LITERACY.SL.8.6**](http://www.corestandards.org/ELA-Literacy/SL/8/6/)
Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

[**CCSS.ELA-LITERACY.L.8.1**](http://www.corestandards.org/ELA-Literacy/L/8/1/)
Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[**CCSS.ELA-LITERACY.L.8.6**](http://www.corestandards.org/ELA-Literacy/L/8/6/)
Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.