A Symphony of Hawaiian Forest Birds
Unit Plan – KAUAI EDITION

Dear Teacher,

We are thrilled to partner with you to launch this exciting project that brings music, art, and science together to teach our students about the extraordinary native forest birds of Hawaii and the importance of protecting them.

In preparation for the educational concert, we share this Unit Plan of Study which is comprised of 16 lessons for you to implement prior to attending the grand symphonic performance on February 25t, 2019. Some of the lessons we offer are "mini-lesson" (20-25 mins) in nature and some are "full-lessons" (45-55 mins). Please feel free to choose and modify the lessons that work best for your context.

Moreover, we wrote these lessons with the wide-range of grades 4th-12th in mind. We have included a selection of Literacy Common Core State Standards as well as the Hawaii Content Performance Standards that best align with the lessons. Due to the wide range of grade levels we have included the list of standards (pages 27-36) for you to select and connect to each lesson. Note that while we designed these lessons to be modular in format, they are organized in a progressive sequence beginning with the establishment of basic familiarity with fundamental natural science concepts and ending with critical thinking activities based in real-world conservation scenarios.

It is our hope that you will address the basics of this overall unit plan; however, we also invite you to use it as a guide and draw on your own creativity and experiences. In other words, you know your students best, so please adapt any of the lessons as you see fit. If the suggested activities or resources are not age appropriate, please feel free to substitute any resources (e.g. supplementary multimedia or our online resource extensions at http://www.symphonyofhawaiianbirds.com/), to make the lessons easier or more difficult.

Enjoy the learning and see you at the symphony!

Sincerely,
The Symphony of Hawaiian Bird Curriculum Team

Overall Unit Plan Essential Questions

1. What is a symphony?
2. What are the different categories of species (i.e. native, introduced, invasive) in the Hawaiian Islands, and why should we care about endemic species?
3. How did evolutionary forces drive the speciation of Hawaiian forest birds?
4. What are the threats to Hawaii's forest birds?
5. What can I do to help threatened Hawaiian forest birds?

Prior Knowledge to the Unit Plan

Before this unit of study, we expect students to have a general awareness of what is a symphony. We also expect they will have a general awareness of the birds they see and hear in their everyday life. In accordance with current statewide DOE standards, we expect students to have a base level familiarity with Hawaiian history by the 4th grade.

Unit Plan Part One

Mini-Lesson #1: We Are Going to the Symphony! What is a Symphony?

Overview of Outcomes

1. Students will share their previous knowledge of what they know about the symphony.
2. Students will be introduced to classic symphony culture.

Materials

1. Appendix A - Sequential Alphabet Roundtable
2. Video of Beethoven Symphony (see link below)

Activity Directions

1. Place students in small groups (ideally 4) and hand out Activating Prior Knowledge Handout (see Appendix A) called, *Sequential Alphabet Roundtable.*
2. To activate students knowledge, "What do you know about the Symphony?"
3. Have students individually write or draw images that start with any letter of the alphabet as they can connect to their knowledge of the **symphony**. For guidance, you may provide them a free word example, such as "M" – *Music*, or "V" – *Violin*, etc…Note: Please accept any appropriate response as this strategy is meant to activate students prior knowledge. For example, someone may write grandma under "G" because his or her grandma went to a symphony.
4. Provide students 5 minutes of quiet time to fill out their A-B-C chart individually.
5. Teacher circulates the room to see all the words and terms students already know as it connects to the symphony.
6. After time is called, ask students "How many letters did you fill out?"

7. Have student share their A-B-C knowledge with their small group members and then to the whole class. Ask students if they learned some new terms from one another?
8. Next, have the students pretend they are going to the symphony. Ask how will they behave? What might they wear? Discuss how they might feel if they like the music? Or what if they do not like the music?
9. Next, introduce one of the most popular works of Beethoven. Ask students, "Did anyone write, Beethoven for the letter "B"? If not, have them write in on their ABC chart.
10. Next, play about 2:00 minutes of the video Beethoven 9 - Chicago Symphony Orchestra by Riccardo Muti. Explain that they will be viewing the classic and popular symphony of Beethoven. https://www.youtube.com/watch?v=rOjHhS5MtvA
11. Ask the students to notice what they SEE and HEAR and how the audience ACTS/BEHAVES.
12. After they listen to the video – have students *Turn and Talk* to *Neighbor*: What did you notice by watching this video? How is this the same or different than what you expected from a symphony?
13. Next, if you have time, please share this video: https://study.com/academy/lesson/the-symphony-history-parts-and-function-in-society.html
14. In the final step, have the students go to back to their A-B-C chart and write some *new* words on their chart that they learned or experienced from the videos or class discussion.

Appendix A

Sequential Alphabet Roundtable

Directions: Write a word or draw a picture (you can write more than one word per letter) for as many of the letters of the alphabet you know about the **Symphony.** Any word that relates to what you know, think, experienced or felt about a symphony counts.

A	**B**	**C**	**D**	**E**
F	**G**	**H**	**I**	**J**
K	**L**	**M**	**N**	**O**
P	**Q**	**R**	**S**	**T**
U	**V**	**W**	**X**	**Y**
Z	**Notes:**			

Full-Lesson #2: Natural History of the Hawaiian Islands & Introduction to Hawaiian Forest Birds

Overview of Outcomes

1. Students will be introduced to the concepts of **endemic**, **native**, and **introduced** species, and will be asked to accomplish the following:
    a. Provide examples of each group in everyday life
    b. Describe their respective roles, or niches, in Hawaiian ecosystems
    c. Explain the importance of **endemic** species
    d. List major impacts of **introduced** species
2. Students will possess a basic understanding of Hawaiian forest birds, specifically where they are found, what factors threaten their survival, how many species are left, and why these species are important to both natural ecosystems and Hawaiian culture.

Materials

1. Appendix B or Appendix C - Anticipation Guide
2. KFBRP YouTube channel: https://www.youtube.com/channel/UCbvOh34aU5wyzdwilchkZkA?view_as=subscriber
3. KFPRP website: https://kauaiforestbirds.org/

Begin with Anticipation Guide: A Formative Pre-Assessment Strategy

Activity Directions

1. Have students complete the anticipation guide (see Appendix B or Appendix C) before the lesson. This will assess their understanding of natural science subjects in the Hawaiian Islands. The general questions in this guide are by no means a test; instead, they are designed to activate pre-existing knowledge within students to kickstart their cognitive processing of the subject material. They may work by themselves, in pairs or small groups. Remind students that they should be prepared to discuss and debate their reactions to the statements on the anticipation guide after they have completed it.
2. After students have finished the guide, encourage a class discussion of students' reactions to the statements. Remember, you want to activate their critical thinking about the topic, so dig deeper than students' answers and get to their justifications.
3. Have students read the text with their anticipation guide responses fresh in their minds so they can react to the text as they read. Encourage students to mark or write down where the text supports their initial reaction to statements, or causes them to rethink those reactions.
4. Have a class discussion after reading. Ask students if any of them changed their position on any of the statements. Encourage students to share how they reacted to the text, given their initial responses captured in the anticipation guide. Make sure students share examples from the text where their initial responses were either supported or challenged.

Before beginning the unit, students will be asked to fill out an **anticipation guide** (see Appendix B or C, also available on website). This anticipation guide will also serve an important role in the unit plan assessment stage, in which pre and post-lesson answers will be compared and analyzed.

Appendix B - Anticipation Guide (Version A)

Anticipation Guide

Statement	Agree	Disagree
1. Native forest birds are still alive in Hawaii.		
2. Native forest birds live in Lihue.		
3. Hawaiian forest birds can be found anywhere.		
4. It is ok to release your pet turtle into a river.		
5. Everyone has a family ʻaumakua.		
6. Kaua'is forest birds are extinct.		

Appendix D - Anticipation Guide (Version B)

Anticipation Guide

Have you ever seen a native forest bird in Hawaii? If so, where? What did it look like?	
Where do you think native forest birds live?	
Why do you think Hawaiian forest birds are hard to find?	
If you had a pet bird, would it be OK to release it into the wild? Or if you had a goldfish, would it be OK to release your pet goldfish into the local rivers?	
What can you do to help save Hawaiian forest birds from extinction?	
What is an ʻaumakua? **Does your family have an ʻaumakua? If so, what is your family's ʻaumakua?**	

Mini-Lesson #3: Word Splash

Overview of Outcomes

Students will analyze 19 words/concepts by writing a narrative that demonstrates the structure of the relationships among concepts. Together they will construct word splash stories and listen attentively to their peer's word splash stories.

Materials

1. Appendix D– Splashed Words
2. Video: Jewels of the Forest: https://www.youtube.com/watch?v=pSrzwKf3_O4

Activity Directions

1. As a pre-video viewing activity display the Splashed Words to the students on a projector. Explain that the words on the splash are related to a video they will view.
2. Have students work in pairs or small groups to write a narrative story (any format they want (i.e.,song, fiction, non-fiction, rap, screenplay, etc...) as a way to predict how they think all these words are related and what topic they will be learning about.
3. They must use all 19 words from the splash in their stories.
4. Once students have written their stories, have each pair or teams share their narratives aloud. Have them notice their similarities and differences.
5. Next, tell the students that most of the 19 words come from the the video they are about to see, some are specific to Kauaʻi, and a couple are intimately related. Have them view the video and notice how the "splashed" words are being used in the video. Tell students to compare the connections with their predictions.

Appendix D

Word Splash

Directions: Splash these words up on the projector and have students construct their own stories using each word.

Mini-Lesson #4: Vocabulary Alert: Native vs. Introduced vs. Invasive

Overview of Outcomes

Students will analyze 3 words/concepts by accessing prior knowledge and learning from classmates, teach terms/concepts to classmates, discuss terms and ask follow up questions to demonstrate fluency of concepts.

Students will rank their prior knowledge, cooperatively discuss terms and help classmates fill in knowledge gaps, students will build on their knowledge through discussions and media exposure.

Materials

1. Appendix D– Vocabulary Alert Graphic Organizer
2. Photo Packages: Native, Introduced, Invasive: http://kauaiforestbirds.org/wp-content/uploads/2019/11/Lesson-4_supp.pdf

Activity Directions

1. Each student independently ranks each word 1 - 4 (see Appendix D).
2. If any student in the group rated any words 3 or 4 they will teach these words to their other group members
3. If there is more than one word expert, take turns teaching and compare definitions
4. Next, students will discuss any words they rated 1 or 2 and discuss with group what you think they could mean.
5. Students will learn from the teacher what these words mean (through the use of an activity, video, reading, direct instruction)
6. Students will take notes on the words and be prepared to share meanings with the class.
7. Students will re-rate their words to see if they have a higher ranking.

After a 5-10 min. presentation on the definitions of **native**, **introduced**, and **invasive** species, students will be divided into groups and given packets of animal photographs. They will then be asked to identify each animal as either a **native**, **introduced**, and **invasive** species. (Prizes for the team with the most correct guesses?) Students should be asked if there are any characteristics about the animal that may give their status away.

Appendix D

Vocabulary Alert!

Directions: Rate each word below using this rating system.

Rating System:

4 = I could teach it to the group.
3 = I am pretty sure I know what it means.
2 = I recognize the word but I need a review.
1 = I have NO clue what it means.

RATE BEFORE INSTRUCTION

WORD	4	3	2	1
Native				
Introduced				
Invasive Species				
Endemic Species				
Endangered Species				
Species				

RATE AFTER INSTRUCTION

WORD	4	3	2	1
Native				
Introduced				
Invasive Species				
Endemic Species				
Endangered Species				
Species				

Mini-Lesson #5: The Immigrant Song

Overview of Outcomes

The verbal presentation for this lesson will emphasize that **native** species arrived in the Hawaiian Islands by their own means (e.g. hitchhiked, blown off course, floated with oceanic currents). The classroom will divide into groups, and each group will be given a photograph and information about a **native** organism in Hawaii. Together, they will come up with a story for how that animal got to the Hawaiian Islands, and the group will collectively present story in front of their classmates (to engage younger students, teachers could instruct groups to "act out" their story). This activity activates their creative processing skills by encouraging students to think critically about the physical characteristics of the animal, specifically features that would assist them in colonizing new territories.

Materials

1. Photo resources with species information (http://kauaiforestbirds.org/wp-content/uploads/2019/11/lesson_5_materials_1-3.pdf)
2. Paper for writing stories

Activity Directions

1) Teacher will give a 5-10 minute presentation on the arrival of species in Hawaii, both natural and human-facilitated (for HS level, terminology such as **vector** and **pathway** for species introductions could be emphasized). Important talking points will be optimal conditions for establishment success, characteristics of species that make them successful colonizers, and temporal scales of establishment (rapid vs. gradual colonizers).
2) Classes will be split into groups, with each group given a photograph of an organism that has become established in the Hawaiian Islands and corresponding information about its life history, biology, and geographic range. Students will be prompted to think critically about the characteristics of the organism, with specific regards for its potential as a colonizer. (~10 minutes)
3) After discussion with their groups, students will present their organisms to the class, along with their theories on how that organism arrived and became established in the islands.
4) Teachers will give a summary presentation with our current understanding of how these species arrived in Hawaii. The diversity of the species chosen for this lesson will demonstrate the variety of introduction pathways that facilitate species introductions.

Mini-Lesson #6: Design a Bird

Overview of Outcomes

To encourage students to think about the processes of adaptive radiation, this activity will ask each student to think of a specific environment in Hawaii and to design their own bird species that would be best-suited for living in that environment (requires basic art supplies like crayons, colored pencils, markers, etc.). Students will be asked to explain how they designed their bird (e.g. What kind of physical adaptations does it have, and how are those features advantageous?), and perhaps come up with a short description of their newly created species.

Materials

1. Photo resources with species information (https://kauaiforestbirds.org/meet-the-birds-2/)
2. Scratch paper
3. Art Supplies (colored pencils, crayons, markers)

Activity Directions

1) Teacher will give a 10 minute presentation that serves as an overview of Hawaiian ecosystems; students should be familiar with at least some of the basic habitat types (lava fields, urban environments, lowland forests). The key concept for this presentation is the variety of habitats available to organisms, and the resource types/quantities found there.
2) Students will be prompted to create their own Hawaiian bird species that is specialized for a specific habitat in the islands (~10 min). Teachers can decide whether to assign habitats to each student to challenge them in thinking about the appropriate adaptations for their bird designs.
3) Students can either present their bird designs to the whole class or to small groups. Teachers may choose to highlight specific designs that demonstrate particularly useful adaptations.
4) Teachers will present a debriefing presentation that will showcase adaptations of Hawaiian bird species to these environments. Examples may include the nene goose (clawed feet for navigating lava fields), nectivores like the i'iwi, mamo, or akialoa (curved bills for accessing nectar in lobeliad flowers), and the moa-nalo (pseudoteeth and heavy bills for crushing coarse plant matter).

Unit Plan Part Two

Full-Lesson #7: Mix-And-Mingle Bird Party

Overview of Outcomes

This lesson serves as the students' introduction to the Hawaiian forest birds that will be featured in the symphony. The goal of this lesson is to establish a base familiarity with our endemic Hawaiian forest bird assemblage and to promote recognition of several honeycreeper species. The interactive nature of this lesson promotes active engagement in the information presented to the students; the sheer diversity of forms in these species prompts students to make observations of the color and shape of these birds. Species may be compared and contrasted with one another, drawing out similarities and differences between the birds.

Materials

1. Hawaiian Bird Calling Cards (http://kauaiforestbirds.org/wp-content/uploads/2019/11/activity_7_supp.pdf)
2. Hawaiian Forest Bird Data Graphic Organizer (see Appendix E)

Activity Directions

1) Teachers will give a brief (5-10 minute) introduction/recap of previously discussed topics (e.g. diversity of forms and adaptations, evolutionary processes, endemic species, etc.), and to remind students of the focus of the upcoming symphony visit.
2) Each student will be given a "Bird Calling Card" with a picture of a Hawaiian forest bird and some basic information about that species. Students will be given 20 minutes to walk around and talk with their classmates about their species. They will record important information about the other birds on a short Graphic Organizer (see Appendix E) ~5 species total.
3) Once the information is collected into a graphic organizer the teacher will go over with the entire class, and provide a comprehensive overview of the Hawaiian forest birds. This activity will highlight the diversity of forms among the forest bird assemblage, and familiarize the students with many of the birds featured in the symphonic production.
4) Teachers will present a concluding presentation that will show images of some of the forest birds with brief descriptions of their adaptations and current ranges. Teachers could highlight the conservation status of the species used in the activity; a considerable portion of the bird flashcards in this lesson will be of **extinct** species. Teachers may choose whether to begin presenting information about the extinction crisis here, or to wait until the next part of the unit.

Appendix E

Hawaiian Forest Bird Data Graphic Organizer

Welcome to the Mix and Mingle Bird Party. As you go around the party introducing yourself, please make sure to meet as many other birds as you can and collect some data.

Bird Name	Where do I live?	What do I eat?	What are some of my adaptations?
Example: Palila	Hawai'i (Big Island)	• Māmane seeds • Naio berries • Insects	• Large parrot-like bill • Resistant to māmane toxins

Full-Lesson #8: Bird Beak Morphology

Overview of Outcomes

After being introduced to the Hawaiian forest bird species, students will be given various tools/utensils and an assortment of objects. The students will then be challenged to find the most appropriate equipment for picking up objects of different sizes and shapes. The goal of this lesson is to demonstrate the specialization of beak forms to accommodate different types of food. This will promote a basic, tactile understanding of the reasons behind different beak morphologies in Hawaiian forest birds.

Materials

Activity Worksheet http://kauaiforestbirds.org/wp-content/uploads/2019/11/Suppl_Lesson8.pdf
Utensils (chopsticks, spoons, forceps, binder clips)
"Food Items" (Pennies, Toothpicks, Marbles are ideal)
Plastic Cups
Timers
Calculators

Activity Directions

1) Teachers will begin class with a review of Hawaiian forest bird adaptations, emphasizing the diversity of beak shapes found in Hawaiian honeycreepers. It may be beneficial for teachers to define the term **morphology**, as this will be the focus of the lesson. Teachers will then introduce the activity for the day, and talk about how the students will gain hands-on (beaks-on?) experience in learning about bird beak morphology. Teachers may prompt students to develop hypotheses about which beaks (utensils) will be best suited for certain items. (~15 minute introduction)
2) Teachers will pass out the supplies to groups of 3-5 students. Each student will have an opportunity to try out each utensil set (beak type) in picking up each food type (pennies = bugs, toothpicks = worms, marbles = fruit) and drop it in the plastic cup. The students will have 15 seconds per try. Students will then take the average of all group members' attempts. (20-25 minutes)
3) Teachers will bring the class together to talk about which "beak types" were best suited for picking up each item. Teachers can close class with a debriefing presentation on the diversity of beak shapes and functions in Hawaiian forest birds. Overall, it is important to communicate the specialization of Hawaiian forest birds for specific food types. Concepts such as **ecological niches** can be addressed here. Teachers may also prompt students to hypothesize what would happen if a bird's food source disappeared (this could be an effective preface for later lessons on species extinctions).

Full-Lesson #9: Aspiring Naturalists

Overview of Outcomes

This lesson may serve as an effective method of introducing Hawaiian forest bird species to middle/high school students. Teachers will show their classes a slideshow of Hawaiian forest bird images (photographs, sketches, museum specimens). Students will play the role of naturalists, making observations about the characteristics of the birds they see, and will make hypotheses about the life history of the birds. In many cases, real world naturalists have had to rely on scant resources to categorize and characterize species. This lesson is designed to encourage students to access pre-existing knowledge of the functionality of morphological features and to make educated guesses of how these species lived. This activity will benefit from the diversity of adaptations possessed by endemic Hawaiian avian fauna. At the end of the activity, student hypotheses will be compared to current scientific understanding of these species.

Materials

Photo resources with species information (http://kauaiforestbirds.org/wp-content/uploads/2019/11/Lesson9_supp.pdf)
Double Entry Journal (see Appendix F)

Activity Directions

1) Teachers will provide an introductory direct instruction (10 minutes) that frames the lesson as an exercise in scientific observation and hypothesis development. Early naturalists often had to rely on sketches and preserved specimens to taxonomically classify species. The students will have access to high-resolution photographs to create their own hypotheses for these forest bird species.
2) Classes will be divided into small groups, and each group will be provided with a photograph of a Hawaiian forest bird species (4-5 groups is ideal). Using the Double Entry Journal, students will be instructed to make and write careful observations of the physical characteristics of their species (e.g. beak morphology, coloration, size) and make inferences about that species' life history (diet, reproductive strategy, etc.). This discussion should last ~10 minutes.
3) Groups will present their species to the class and talk about their hypotheses. Teachers should prompt their students to talk about certain adaptations possessed by the birds (e.g. beak morphology for the nectivores), and the reasoning behind their hypotheses.
4) Teachers will give a presentation on the Hawaiian forest birds discussed previously. Similarities and differences between hypotheses and actual behavior/adaptations should be drawn.

Appendix F

Double Entry Journal For Aspiring Naturalists

Please complete a Double Entry Journal (DEJ) using a two-column format for each photo.

Collect Information	**Personal Reactions**
On this side of your journal: Make careful observations of the physical characteristics of their species (e.g. beak morphology, coloration, size) and make inferences about that species' life history (diet, reproductive strategy, etc.). Write down these observations.	On the personal side of your journal: Relate the information to your experiences; put the ideas into your own words, draw conclusions; make connections to other readings; create visuals; ask questions, record examples.

Full-Lesson #10: Forest Bird Family Tree

Overview of Outcomes

This activity will present the Hawaiian forest bird assemblage through the lens of evolutionary biology and taxonomy. The diversification of Hawaiian honeycreepers across ecological niches in the Hawaiian Islands is one of the greatest case studies in adaptive radiation in the world. The fact that these species are only found in Hawaii makes them outstanding candidates for teaching topics like evolutionary biology in Hawaii's schools. Students will be prompted to think about lineages of forest bird groups through this activity, specifically the methods in which organisms are sorted taxonomically. In sorting these species into families, concepts such as **convergent evolution** and **parsimony** may be discussed. Inconsistencies between derived family groups and currently acknowledged understandings of honeycreeper genetics could provide an opportunity to discuss potential errors in deriving taxonomic groups solely based on morphological features.

Materials

Photo resources with species information http://kauaiforestbirds.org/wp-content/uploads/2019/11/activity_7_mix_and_mingle_birds_12.pdf
Taxonomic tree of Hawaiian honeycreeper families (https://sites01.lsu.edu/wp/mnspapers/files/2014/10/85.pdf)

Activity Directions

1) Teachers will present a brief introduction on the evolutionary processes that led to the adaptive radiation of Hawaiian forest bird species (depending on previous lessons completed, teachers can decide how long they would like to lecture on this topic, but 10-20 minutes should be sufficient).
2) Classes will be divided into groups, with each group given a packet of photographs of Hawaiian forest birds. The students will be instructed to create a "family tree" that represents the evolution of forest birds, with an emphasis on defining specific groups of birds based on shared characteristics.
3) After 20 minutes of discussion, each group will present their tree to the rest of the class, providing their reasons for creating their trees.
4) This activity will conclude with the teacher giving a brief presentation of our current understanding of the evolution of Hawaiian forest birds from a common ancestor into the multitude of forms seen today. Teachers should present several taxonomic trees that represent our current understanding of honeycreeper genetics. It should be emphasized that scientific consensus of taxonomic classifications is constantly changing; teachers may wish to present analogous scenarios of reclassifications based on modern technologies (e.g. genetic analyses, genome sequencing, etc.).

Full-Lesson #11: Student Research Projects

Overview of Outcomes

Students will choose a Hawaiian forest bird species (this can either be in groups or as individual students) and then conduct their own research on this species using online/library resources. (This can be assigned as homework after the first day's lesson.) The students will prepare a brief presentation on the bird species which will cover basic information such as physical appearance, diet, habitat, call, role in Hawaiian ecosystems, cultural importance, etc. Of particular importance will be a focus on its current geographic range and the threats faced by the species.

Materials

List of online sources for Hawaiian honeycreeper information:
https://www.dropbox.com/sh/j57p1g6dj8m6yrl/AACneFaI8qOx8vJvbXLmykD1a?dl=0 (see website)
and
http://www.symphonyofhawaiianbirds.com/hawaiian-forest-bird-unit-plan.html

Activity Directions

Teachers will determine the amount of time they would like to devote to this topic. This largely self-guided research project can culminate in a variety of presentation formats, including powerpoint presentations, small group discussions, poster boards, and artistic depictions of the species. Based on the level of investment in this lesson, teachers may find it necessary to give students 1-2 weeks to gather information and create presentation.

Unit Plan Part Three

Mini-Lesson #12: Extinction Crisis Timeline

Overview of Outcomes

This activity will reprise themes from the previous activity on invasive, introduced, and indigenous/native species. Classes will be split into groups that will be given the packets (see below) containing images of specific events (initial species arrivals, Western contact, invasive establishment, etc.) and approximate dates, and tasked with matching these elements and creating a timeline for these events.

This activity is designed to help students think about the temporal scale of Hawaiian natural history and to make connections between the increase of invasive species and diseases and the decline of our native species. A key component of this lesson will be communicating the rapid pace of habitat degradation in the Hawaiian Islands.

Materials

Lessson 12: https://kauaiforestbirds.org/tools-for-teachers/

Events include (in order):

- Volcanic eruption/ emergence of main Hawaiian Islands from Hawaiian hotspot ~5.7 MYA
- Finch ancestor arrives in Hawaii by chance, most likely blown off course.
- Ancestors of Hawaii's forest birds start to adapt and fill niches almost as soon as the islands formed, based on food sources and habitat types, further evolving as other islands (ʻOʻahu, Maui, and Hawaiʻi) begin to form and new habitats and food sources are created. Based on this article (link) the largest burst of evolution into new species occurred between ~4-2.5 ma. (adaptive radiation)
- Polynesians arrive and begin to change the landscape. They also bring with them many other species some begin to compete with the existing species. As many as 35 species of birds go extinct. (~1000 ad)
- Pacific rats and Pigs arrive with the Polynesians ~900 years ago
- Westerners (Cooke and his men) arrive bringing European rodents with them, and further change the landscape. Birds retreat as their habitat is changed or destroyed -(1778)
- Mosquitos arrive on whaling ships, bringing avian diseases (avian malaria) with them (1826). As we move forward in time, the birds retreat to high elevation forested areas where it is too cool for mosquitos to breed.
- Hawaii becomes a state- (1959)
- Hurricane Iniki (last time Kamaʻo ever seen)-(1992)
- Birds placed on the endangered species list (Puaiohi-1967, ʻakikiki & ʻakekeʻe -2010, ʻiʻiwi listed as threatened -2010
- Rapid Ohia Death threatens native forest which the birds depend on for their habitat (2014).
- Climate change alters weather patterns and increases the elevation which mosquitos can breed. Birds are forced to retreat to the even smaller areas of the forest still free from mosquitos and avian malaria. (present day)
- Some birds begin to develop resistance to avian diseases, others continue to decline in number as the temperature and breeding elevation continue to increase. In the near future, it is possible that only the most disease resistant species will remain. ...FUTURE

Activity Directions

1) Teachers will give a short (~5 minute) introduction to this activity. Students are to be instructed to arrange these events according to their prior knowledge and intuition.
2) Classes will be split into groups, with each group given a packet. The class will have ~10 minutes to pair events with approximate dates and to arrange them chronologically.
3) Teachers will present the correct timeline to the class, noting the amount of time it took endemic species to emerge and how these species were pushed to the brink of extinction within 200 years of Western contact.

Full-Lesson #13: Wildlife Management Scenario

Overview of Outcomes

In this activity, students will assume the roles of different stakeholder groups within Hawaii's wildlife management scenario. Classes will be split into four different groups (wildlife managers, cultural practitioners, legislators, and the concerned public). These groups will be given a sheet with background information on the group's motivations, primary negotiation terms, and relations to other groups. The entire class will be given the ultimate goal of collaboration to create effective management strategies for Hawaiian forest birds, which will require negotiation between stakeholder groups. This activity will guide students in an exploration of values held by each stakeholder group, showing them perspectives from involved parties in Hawaii's wildlife management scenarios.

Materials

Information sheets for each stakeholder group (distributed to students before class, TBA on website)

Activity Directions

1) Before class, students should have reviewed the information sheets and the class should be divided into four factions (wildlife managers, cultural practitioners, legislators, and the concerned public).
2) Teachers will begin class with a brief review of the previous material covered (~5 minutes), ideally touching upon the imminent forest bird extinction crisis and the creation of conservation strategies to assist in population recoveries.
3) Groups will be given ~10 minutes to discuss their faction's talking points with their teammates and prepare a 2-3 sentence summary of their faction's motivations for protecting Hawaiian honeycreeper species.
4) Short presentations by groups regarding their position on forest bird conservation (5 minutes).
5) Teachers will then introduce potentially controversial conservation options to the group discussion (e.g. **genetically engineered mosquitoes, captive breeding facilities, introduction of new species to fill open niches**). Teachers will proctor the discussion and facilitate debate over disagreements between factions (20-30 minutes).
6) Teachers may choose to wrap up discussion with a brief statement about the reality of conservation issues in Hawaii. While all of these groups ultimately fight for the survival of these species, there is often disagreement on the appropriate methods to accomplish conservation.

Full-Lesson #14: Hawaiian Wildlife in Local Culture

Overview of Outcomes

Students will be prompted to consider the importance of Hawaiian wildlife in modern culture and society. Plants and animals in Hawaii have often been associated with certain characteristics which make them appealing as ʻaumakua or as mascots for schools and other organizations. This activity will delve into the reasons behind the reverence for certain animals. Students will be asked to consider their school's mascot, or any sort of animal or plant that is associated with a particular social group. What are the qualities of that organism? Why would it be chosen to represent that organization? Is the species endemic to the Hawaiian Islands? If so, does it have a Hawaiian name, and doe that name carry any sort of connotations? If an animal or plant is chosen as a family's ʻaumakua, how should that family honor and protect that particular species?

Materials

In-class reading: "*The ʻAumakua – Hawaiian Ancestral Spirits*" by Herb Kane (Hawaiʻi Division of Aquatic Resources) (pp. 148-149)

Activity Directions

1) Teachers will begin class with a brief overview of the lesson topic (< 5 minutes) and hand out copies of the reading to students. Students will be given 5-10 minutes to complete the reading.
2) After finishing the reading, students will discuss the topic with their classmates in small groups. (~15 minutes) To organize discussion, teachers may wish to distribute a worksheet/table for students to address key talking points (e.g. "do you know anyone with a family ʻaumakua?", "what is the significance of ʻaumakua to Hawaiian families?", "why do we have mascots for groups like sports teams and schools?")
3) Teachers will reorganize the class to discuss highlights from the small group discussions. They may wish to talk about the significance of their own school's mascot, or have students with family ʻaumakua speak to the class about their perceptions and beliefs regarding ʻaumakua.

Full-Lesson #15: Saving the Hawaiian Forest Birds

Overview of Outcomes

In this lesson, students will work together in groups to brainstorm conservation strategies for protecting Hawaiian forest birds. By this point they should be familiar with the threats faced by these species; consequently, the management strategies they create should effectively safeguard these endemic species from further harm. Students will be prompted not only to think about ways to protect the actual species from extinction, but also to think of ways to promote awareness of our native forest birds and eco-friendly behavior in their everyday lives.

Materials

Teachers should determine the best method for their classes to visualize conservation strategies. Younger grades may benefit from drawing out their plans on large pieces of paper, while older students may benefit from basic graphic organizers that categorically address parameters such as cost-effectiveness, feasibility, and potential impact of their conservation strategies.

Activity Directions

1) Teachers will begin the class with a review of the extent and severity of the imminent Hawaiian forest bird extinction crisis. They should also introduce the purpose of conservation strategies (e.g. creation of the endangered species list, establishing protected areas like forest reserves, captive breeding programs). Teachers may choose to talk about success stories in global conservation (e.g. restrictions on whaling, species reintroductions), but should refrain from talking about current management strategies for Hawaiian forest birds until the end of the lesson (15 minutes).
2) Classes will be divided into groups, with each group tasked with creating the most effective management strategy for Hawaiian forest birds. This activity calls upon their newly acquired knowledge of the birds' preferred habitats and life histories, as well as the threats to those species' survival (15 minutes).
3) Groups will present their management strategies to the class, and provide reasons for why they think their method will be the most effective means to protect our native forest birds (5 minutes).
4) Teachers should bring the class conversation back to what they can do as students to promote forest bird conservation in Hawaii. Options should be discussed and assessed in an open dialogue between groups to identify the effectiveness of these strategies (15 minutes).

Mini-Lesson #16: Music: For the Birds?

Overview of Outcomes

For centuries, people have found musical inspiration in the songs and vocalizations of birds. The naturally melodic sounds of birds paired with their aesthetic beauty have immortalized certain species within popular culture, synonymizing their names with specific emotions or sonic qualities. The goals of this lesson are to provide students with background knowledge of musical works that have incorporated or been inspired by birdsongs and to communicate the power of the arts in shaping societal perceptions of nature. It is important for students to understand that the Hawaiian forest bird symphony performance represents a continuation of this musical tradition of inspiration derived from the natural world. Teachers may find an opportunity in this lesson to talk about the motivations behind the symphony's creation and its unique focus on promoting conservation goals.

Materials

Teacher's computer (internet access to open links on project website)

Activity Directions

1) Teachers will begin class with a general summary of the material they have covered so far (natural history of the Hawaiian Islands, the Hawaiian forest bird species, the extinction crisis, and conservation strategies). This lesson brings the focus back to the upcoming symphony performance. Teachers should look to their students for the answer to this question: "why are we going to the symphony?" Why is this an important topic to educate the public on? (10 minutes)
2) Teachers should take ~10 minutes to ask their students to think of songs about birds, and prompt them further to think about what those birds represent in those songs. This part of the lesson serves to encourage students to think critically about the cultural significance of birds, and the emotional reactions elicited by them in music and the arts. (Below is a selection of classical and modern pop songs that teachers may play in class to encourage discussion)

Nightingale

- Beethoven's *Third Symphony*
- Igor Stravinsky's *Le chant du rossignol*
- Handel's *L'Allegro, Il Penseroso ed Il Moderato*
- Ottorino Respighi's *The Birds* and *Pines of Rome, The Pines of the Janiculum* ending)
- Andre Rieu's *Nightingale Serenade* (Toselli Serenade)

Cuckoo

- Saint-Saëns' *The Carnival of the Animals*
- Louis-Claude Daquin's *Le Coucou*
- Frederick Delius' *On Hearing the First Cuckoo in Spring*

Lark

- Ralph Vaughan Williams' *The Lark Ascending*

Miscellaneous Classical Music Pieces

- Einojuhani Rautavaara's *Cantus Arcticus*
- Olivier Messiaen's *Oiseaux Exotiques*
- Sergei Prokofiev's *Peter and the Wolf*
- Antonio Vivaldi's *Flute Concerto in D, Op. 10/3, RV428 "The Goldfinch"*
- *Kookaburra* (Australian traditional song)

Modern Pop Music Inspired by Birds

- The Beatles - "Blackbird", "Free as a Bird"
- Kalapana - "Nightbird"
- Olomana - "Seabird"
- George Keahi - ""Ulili E"
- Bob Marley - "Three Little Birds"
- Michael Jackson - "Rockin' Robin"
- Lynyrd Skynyrd - "Free Bird"

STATE CONTENT STANDARDS/BENCHMARKS

This unit of study address all of the following content and literacy standards. Please select the ones appropriate for your planning purposes.

4th Grade

Strand: Life and Environment Sciences	
Standard 3: Life and Environmental Sciences: ORGANISMS AND THE ENVIRONMENT: Understand the unity, diversity, and interrelationships of organisms, including their relationship to cycles of matter and energy in the environment	
Standard 4: Life and Environmental Sciences: STRUCTURE AND FUNCTION IN ORGANISMS: Understand the structures and functions of living organisms and how organisms can be compared scientifically	
Topic	Interdependence
Benchmark SC.4.3.2	Describe how an organism's behavior is determined by its environment
Sample Performance Assessment (SPA)	The student: Describes how an organism's behavior is affected by its environment (e.g., courting, nesting, feeding patterns).

Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms	
Topic	Unity and Diversity
Benchmark SC.4.5.2	Describe the roles of various organisms in the same environment
Sample Performance Assessment (SPA)	The student: Describes the roles (e.g., decomposers, producers, consumers) of various organisms that inhabit the same environment.

Topic	Unity and Diversity
Benchmark SC.4.5.3	Describe how different organisms need specific environmental conditions to survive
Sample Performance Assessment (SPA)	The student: Illustrates and explains how specific environmental conditions support the survival of specific organisms.

5th Grade

Strand: Life and Environmental Sciences	
Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms	
Topic	Heredity
Benchmark SC.5.5.1	Recognize that some traits of living things are inherited and others are learned
Sample Performance Assessment (SPA)	The student: recall inherited traits (e.g. eye color, flower color) and learned characteristics (e.g. riding a bicycle)

6th Grade

Strand: The Scientific Process	
Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process.	
Topic	Scientific Inquiry
Benchmark SC.6.1.1	Formulate a testable hypothesis that can be answered through a controlled experiment
Sample Performance Assessment (SPA)	The student: Constructs a hypothesis (e.g., if, then, and because statement) that is tested through a controlled experiment.

7th Grade

Strand: The Scientific Process	
Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process.	
Topic	Scientific Knowledge
Benchmark SC.7.1.3	Explain the need to revise conclusions and explanations based on new scientific evidence
Sample Performance Assessment (SPA)	The student: Explains why conclusions and explanations need to be revised, based on new evidence in a journal article and/or published scientific evidence.

Strand: Life and Environmental Sciences	
Standard 3: Life and Environmental Sciences: ORGANISMS AND THE ENVIRONMENT: Understand the unity, diversity, and interrelationships of organisms, including their relationships to cycles of matter and energy in the environment.	
Topic	Interdependence
Benchmark SC.7.3.2	Explain the interaction and dependence of organisms on one another
Sample Performance Assessment (SPA)	The student: Explains how organisms in a biological community interact (e.g., predator/prey, producer/consumer, parasitism, mutualism, competition, cooperation, niche).

Standard 4: Life and Environmental Sciences: STRUCTURE AND FUNCTION IN ORGANISMS: Understand the structure and function of living organisms and how organisms can be compared scientifically	
Topic	Classification
Benchmark SC.7.3.2	Classify organisms according to their degree of relatedness
Sample Performance Assessment (SPA)	The student: Analyzes the degree of relatedness among selected organisms by comparing the similarities and differences found in internal and external anatomical features.

8th Grade

Strand: The Scientific Process	
Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process.	
Topic	Scientific Inquiry
Benchmark SC.8.1.1	Determine the link(s) between evidence and the conclusion(s) of an investigation
Sample Performance Assessment (SPA)	The student: Determines if the conclusion(s) and evidence from an experiment or other sources are logically linked.

Strand: Life and Environmental Sciences	
Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms	
Topic	Biological Evolution
Benchmark SC.8.5.1	Describe how changes in the physical environment affect the survival of organisms
Sample Performance Assessment (SPA)	The student: Explains how organisms respond (e.g., some organisms adapt, some move out, others die) to changes in the physical environment, such as tsunamis and hurricanes.

9th-12th Grades

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

Science and Engineering Practices

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- **Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.**

- **Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.**

Disciplinary Core Ideas

· **A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.**

Crosscutting Concepts

· Much of science deals with constructing explanations of how things change and how they remain stable.

HS-LS2-7. **Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

Science and Engineering Practices

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

· Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Disciplinary Core Ideas

· A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

Crosscutting Concepts

· Much of science deals with constructing explanations of how things change and how they remain stable.

HS-LS4-1. **Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.** [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

Science and Engineering Practices

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence.

Disciplinary Core Ideas

- Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence.

Crosscutting Concepts

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future.

HS-LS4-4. **Construct an explanation based on evidence for how natural selection leads to adaptation of populations.** [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

Science and Engineering Practices

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Disciplinary Core Ideas

- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not.

Crosscutting Concepts

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future.

HS-LS4-5. **Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.** [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

Science and Engineering Practices

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments.

Disciplinary Core Ideas

- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.
- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost.

Crosscutting Concepts

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

LITERACY COMMON CORE STATE STANDARD

4th & 5th Grade

CCSS.ELA-Literacy.RL.4.4
CCSS.ELA-Literacy.RL.5.4
Determine the meaning of words and phrases as they are used in a text.

6th & 8th Grade ELA Literacy

CCSS.ELA-Literacy.RL.6.1

Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-Literacy.RL.6.2
Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
CCSS.ELA-Literacy.RST.6-8.1
Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-Literacy.RST.6-8.2
Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-Literacy.RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-Literacy.RST.6-8.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.
Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
CCSS.ELA-Literacy.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.RST.6-8.8
Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
CCSS.ELA-Literacy.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

9th & 10th Grade Reading Science and Technical

CCSS.ELA-Literacy.RST.9-10.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*.
CCSS.ELA-Literacy.RST.9-10.5
Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).
CCSS.ELA-Literacy.RST.9-10.6
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address

11th & 12th Grade Reading Science and Technical

CCSS.ELA-Literacy.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCSS.ELA-Literacy.RST.11-12.8

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCSS.ELA-Literacy.RST.11-12.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
CCSS.ELA-Literacy.RST.11-12.5
Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CCSS.ELA-Literacy.RST.11-12.6
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved
CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCSS.ELA-Literacy.RST.11-12.2
Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCSS.ELA-Literacy.RST.11-12.3
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.