LESSON 4

Long Time Coming

insidethegreenhouse.org/shine

Long Time Comin' Choreography: https://vimeo.com/217015607

The creation of this curriculum has been funded in part through Inside the Greenhouse project at CU Boulder

This lesson strives to address NGSS, Colorado 2020 and JeffCo Generations standards and goals, cited at the bottom of the lesson, by communicating science through embodied expression

Description

Students will rehearse and perform the song "Long Time Coming" from *Shine* as a class and discuss the ideas, concepts and challenges of the performance.

Concepts

1. Photosynthesis enables plants to create their own food and serve as the base of the terrestrial food chain
2. Both leaders and followers are needed for groups to use embodied communication together
3. The sun's energy drives life on earth

Outcomes

Upon Completion of this lesson, students will be able to:

1. Identify autotrophs and heterotrophs in Colorado
2. Use embodied communication as a group including both leaders and followers
3. Use embodied communication to show how the sun's energy drives life on earth

Shine, The Musical
insidethegreenhouse.org/shine

Inside the Greenhouse

University of Colorado Boulder

Lesson 4: Long Time Coming

Connections to the Fossils in the Classroom materials will be noted in the side bars of lessons 2-4

Outline

I. Set Up (20 min.)

For this lesson, we'll be setting up and performing the first few minutes of *Shine*. As a teacher, start by watching the "Inside the studio" video (**https://vimeo.com/216902188**) and the "Long Time Coming" video (**https://vimeo.com/217015607**) in the choreography section of the *Shine* website: **http://www.insidethegreenhouse.org/shine/shine_choreography.html**. The first video should be helpful for considering how to work with students and prepare for the first song of *Shine*. The second video is an example of the choreography you'll be teaching for this song.

Read through pages 2 and 3 three of the script, which will be performed as part of this lesson.

You'll need a screen, projector, and an internet connection for this lesson.

Materials Needed

- Large sheet, preferably brown, to cover students and represent them being buried in the earth

The Fossils in the Classroom kits are available for free and provide hands-on supplemental activities to help students consider geologic time

II. Introduction (10 min.)

Lessons 2-4 offer connections to the University of Colorado Natural History Museum Fossils in the Classroom kit. The kits are available for free to Colorado schools and provide hands-on supplemental activities to help students consider geologic time.

To get a University of Colorado Museum of Natural History Fossils in the Classroom kit, that includes 18 specimens, 5 lesson plans and support materials for your classroom or school, please contact Jim Hakala, Senior Educator, University of Colorado Museum of Natural History at 303-492-4458, or **james.hakala@colorado.edu**.

Behavior Guidelines: This lesson involves embodied learning. Please review the "Guidelines for Embodied Lessons in the Classroom" included in this curriculum.

Learner Level Assessment: "Scattergories"
Divide students into groups of two to five. Explain the game: They will be given a category and their goal is to create a list of five items that they don't think any other group will think of in that category. They will only be given points for unique answers. Each round, they will only have two minutes to brainstorm. At the end of the round, have one representative come up and write the group's answers on the board.

Example: (This will also be the category you use for the first round)

Organisms in Colorado that make their own food (Autotrophs):

Group 1:	Group 2:	Group 3:
~~Ponderosa pine~~	~~Maple tree~~	Asparagus
~~Grass~~	Apple tree	~~Ponderosa pine~~
~~Mice~~	Cattails	Lilac
Blue Columbine	Lilly pad	Cherry tree
Algae	~~Grass~~	Blue Spruce
Points: 2	Points: 3	Points: 3

In this round, group three wins because they have the most unique answers. You can keep track of scores through the rounds or start over each round. Some answers may spark some debate though in this round, there's a clear line between autotrophs and heterotrophs. If there is a debatable answer, the teacher should ask the group that provided the answer to specify what they meant and based on their answer decide if they get the point.

In the next round, ask students to brainstorm animals that get their food from outside their bodies (heterotrophs). If time allows and you'd like to play a third round, ask students to form a list of autotrophs that regularly serve as food for heterotrophs.

Assessment (Outcome 1): *Students identify Colorado autotrophs and heterotrophs through playing scattergories*

III. Embodied warm up activities (30 min.)

"1 by 2 by Bradford"

Objective: Fostering concentration and working together

Relevance of Activity to lesson: Helps students begin to think about replacing verbal communication with movement & sounds.

Activity: Have everyone partner up. Start by telling each pair to count to three, but by alternating numbers (person A says 1, person B says 2, A says 3, B says 1, A says 2 and so on). After a minute of that, tell the groups to continue doing this, but replace 3 with a sound (the sound each group creates should remain consistent throughout the activity). Let all the groups practice that for a minute, and then tell them they now need to replace 1 with a movement (the movement each group creates should remain consistent throughout the activity). After a minute or so of practicing that, tell each group that they now have to replace 2 with a movement and sound (that too should remain consistent throughout the activity). Let the pairs continue for another minute, and encourage them to experiment with changing the tempo, volume, and energy levels. You can ask if any groups would like to demonstrate what they came up with for the entire group one at a time.

"Rhythm Repeater"

Objective: Help students to consider leading and following in an activity

Relevance of activity to lesson: This activity will help prepare students to create movements and work together in the next part of the lesson

Complete the Fossil Kit Laboratory Investigation 4 worksheet

"How Fossils Form"

www.colorado.edu/cumuseum/sites/default/files/attached-files/fossilkitlaboratory investigation4.pdf

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Activity: Gather students is a large circle and send one student out of the room. This student will come back in once they hear the rhythm has begun and they will try to guess who is leading. Ask a student in the circle to start a rhythm that everyone can follow. They can create this rhythm by clapping, stomping, snapping, etc., but shouldn't use language. Let the rhythm leader know that they should change rhythms every 20 to 30 seconds. When they do, everyone should follow as quickly as possible. When the guessing student comes back in the room, they will have three chances to guess who is leading the rhythm. If they don't guess right, the leader reveals themselves. Pick a new student to go outside and a new rhythm leader and repeat for two to three rounds.

Assessment (Outcome 2): *Students work together as a group including leaders and followers while using embodied communication*

Classroom Activities

Identify the plant fossils and the animal fossils included in the Fossil Kit

www.colorado.edu/cumuseum/materials-and-resources/fossil-specimen-photos

Fossilized wood from the Age range of Triassic to Pleistocene. Credit: University of Colorado Natural History Museum.

IV. Rehearse and choose movements (20 min.)

As a class, watch the first 7 minutes of the "Inside the Studio" feature with composer Tom Wasinger: **https://vimeo.com/217016473**. This should help give students a feel for how the song was composed and which instruments were used.

Choose either the music with vocals or the music without vocals, or start with vocals and move to just music, and practice the first song from *Shine*. Both music options are available here: **http://www.insidethegreenhouse.org/shine/shine_music.html**. To begin, all students should decide on what motions the plants will perform as they go through the act of photosynthesis described in the script below (even if they made animal capes). Then, all students should practice as animals instead of plants and decide on a set of movements together. Sections that necessitate movement choices have been highlighted below. After all movements have been chosen and the song has been practiced, you'll be ready to put on costumes and act out the first two pages of the script:

SOUND CUE: Long Time Comin' (Primordial sounds, then 2 counts of 8 introductory instrumental music for entrance of ancient plants and animals. After the introductory 2 counts of 8, all students enter slowly during the following lyrics. Ancient plants grow, stretch, creep forward, and reach moving around–taking up the space, filling it in with their movement/growth. Ancient animals emerge into the space as well, they are along the sides exploring and moving as their animal would move, looking at the plants hungrily.)

Long time comin', a long time a comin' comin', long time comin' along
Long time comin', a long time a comin' comin', long time comin' along
Long time comin', a long time a comin' comin', long time comin' along
Long time comin', a long time a comin' comin', long time comin' along

(7 counts of 8 rhythmic music continues low underneath to maintain the mood, then a bit more of just primordial sounds, fades out–Directly after the lyrics are done, Sol should enter and speak)

In the following lines from the script, the teacher should perform the part of Sol (the sun):

Sol: The weirdest thing happened about 300 million years ago. I was just

Classroom Activities

Use the Fossil Specimen Identification Cards and Annotated Object Lists to identify the age of the plant fossils and the age of the animal fossils in the kit

www.colorado.edu/cumuseum/materials-and-resources/fossil-specimen-photos

shining down on this planet like I do on all my planets—I have eight—and then these ancient plants and animals start doing this musical number. Yes, a musical number. Weird, right? I think, yeah, I'm down with this. Life is getting more and more animated on this planet. I can adjust.

(Sol watches as the ancient plants continue to grow, stretch, creep forward, and reach moving around.)

Ancient animals continue moving as their animal would move, now circling around the plants looking at them hungrily.) This dance number is kind of interpretive, but it looks like the ancient plants are taking in CO2 from the atmosphere to photosynthesize my energy to store it up as carbon. I think they are dancing the different parts of photosynthesis.

(Ancient plants reach towards the Sun for her energy.) They need my energy from the Sun. (Ancient plants enact taking up water from their roots.) They take up water through their roots. (Ancient plants enact having excited cells.) That excites their cells. (Ancient plants enact breathing.) They breathe in CO2 from the atmosphere. (Ancient plants grow.) They grow. (Ancient animals move in and begin feasting on the ancient plants.) They get eaten by ancient animals; so now the animals have my energy in them too. (All die slowly and dramatically, landing together in a clump so the brown cloth can completely cover everyone.) And then they all die, both the plants and the animals. And this keeps happening over and over again.

Assessment (Outcomes 1-3): *Take a moment and ask everyone to move around the room like the plant or animal they drew in lesson two. Then, sing long-time-coming and read through the script as students act out their cape-specific roles. If time allows, also work as a class to create movements for long-time-coming (you can use those provided in the video, or come up with your own).*

V. Follow-Up Activities

a. Switch roles

Ask students to switch roles from plant to animal.

Assessment (Outcomes 1-3): *Once everyone has switched, go through pages two and three of the scripted again in the new roles. Students are also welcome to come up with new moves for their new roles.*

Explore the CU Museum of Natural History's virtual Paleontology Hall

www.colorado.edu/cumuseum/3d-virtual-paleo-hall

Visit the Fossils in the Classroom web site

www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom

b. Spruce it up!

Now that you've had some practice in both plant and animal roles, ask students to create an embodied expression for the lifecycle of Colorado's state tree, the blue spruce. This may require a little research and could include many stages, but the basic stages should be:

Assessment (Outcome 2): *Ask each group to design and create their symbol as a group. This will take coordinated team work, and each group member should agree with what's designed and contribute. After symbols have been designed, as each group to present them to the class and explain the choices they made for design and content.*

1. Seed is pollinated and escapes the cone
2. The seed germinates and begins to grow
3. Baby tree
4. Young tree
5. Adult tree (what all will these trees have to go through? Fire, weather, drought, etc.?)
6. Dying, and becoming a home to animals
7. Rotting and becoming soil

Assessment (Outcomes 1-3): *Ask each student choreograph movements for each stage of the trees life and act them out as you narrate.*

VI. Additional Resources

a. Sources

Script of *Shine*: http://www.insidethegreenhouse.org/shine/assets/shine_script.pdf

Music of *Shine*: http://www.insidethegreenhouse.org/shine/shine_music.html

Choreography of *Shine*: http://www.insidethegreenhouse.org/shine/shine_choreography.html

b. Vocabulary

Autotroph: An organism that can make its own food

Heterotroph: An organism that must find food from other sources besides itself

Photosynthesis: The process through which a plant combines carbon

dioxide and water to create sugar using the energy of the sun

Choreography: The use of physical movements with the body in set sequence that intentionally communicates an idea, emotion, or concept

Dramatic action: the conflict, tension, uncertainty in a scene that moves the action of a story forward—the physical action being taken on stage, but also the motivations for those actions over the course of a story

For additional resources especially the online section

www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom/materials-and-resources/online-resources-teachers-and

VII. Standards Addressed

a. Next Generation Science Standards Addressed

4-PS3-2 Energy
Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-LS1-1 From Molecules to Organisms: Structures and Processes
Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-ESS1-1 Earth's Place in the Universe
Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-ESS3-1 Earth and Human Activity
Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

5-PS3-1 Energy
Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

b. JeffCo Generations Skills

Self-Direction & Personal Responsibility: Students take initiative, are

inquisitive, entrepreneurial, and curious. They persevere through challenging situations, take calculated risks, and stand accountable for their actions. They continually advocate for their own needs as well as the needs of others.

Communication: Students learn to effectively communicate in written, digital, artistic, and oral forms. Students learn to explore and articulate their own points of view, while respectfully exploring and understanding the perspectives of others.

Collaboration & Leading by Influence: Students learn to work together, harnessing the power of teamwork, and learn the importance of influence to motivate others to get things accomplished.

Agility & Adaptability: Students learn to change in response to dynamic situations, environments, and complex problems. Students adjust to disruptions, ambiguity, and uncertainty in themselves, their organizations, and their communities – and thrive in spite of the obstacles.

Colorado Academic 2020 Standards Drama and Theatre Arts

Create

- Create characters from scripts or improvisation using voice, gestures and facial expressions
- Design a scene through an inventive process, and perform the scene

Perform

- Participate collaboratively with partners and groups
- Demonstrate safe use of voice and body to communicate characters

Critically Respond

- Develop selected criteria to critique what is seen, heard, and understood
- Examine character dynamics and relations

Visit the Fossils in the Classroom web site

www.colorado.edu/cumuseum/programs/schools-and-groups/fossils-classroom