

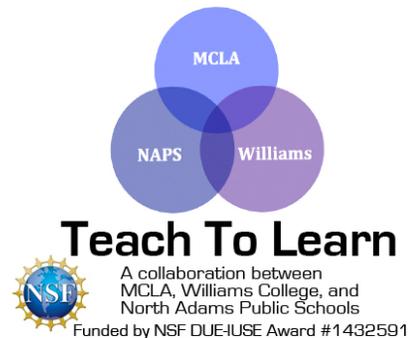
The Evolution of the T2L Science Curriculum

Over the last four years, the Teach to Learn program created 20 NGSS-aligned science units in grades K-5 during our summer sessions. True to our plan, we piloted the units in North Adams Public Schools, and asked and received feedback from our science fellows and our participating teachers. This feedback served as a starting point for our revisions of the units. During year 2 (Summer of 2015), we revised units from year 1 (Summer/Fall 2014) and created new units to pilot. In year 3, we revised units from years 1 and 2 and created new units of curricula, using the same model for year 4. Our understanding of how to create rich and robust science curriculum grew, so by the summer of 2018, our final summer of curriculum development, we had created five exemplar units and established an exemplar unit template which is available in the T2L Toolkit.

We made a concerted effort to upgrade all the existing units with exemplar components. We were able to do much, but not all. So, as you explore different units, you will notice that some contain all elements of our exemplar units, while others contain only some. The fully realized exemplar units are noted on the cover page. We did revise all 20 units and brought them to a baseline of “exemplar” by including the Lessons-At-A-Glance and Science Talk elements.

Grade 1

Patterns in Our World



T2L Curriculum Unit



Patterns in Our World

Earth and Space Science/Grade 1

In this unit, students will explore patterns occurring in the natural world. The first half of the unit focuses on seasons and includes stories to help students understand how things change throughout the four seasons. Students will then observe, describe, and learn to predict the movement of the sun, moon, and stars. Hands-on activities and educational videos supplement the class discussions and lessons throughout the unit.



Unit Creation and Revision History

Authors:

Lisa Marceau, Grade 5 Teacher, Colegrove Park Elementary School

Connor Mulhall, Statistics major, Williams College

Lindsay Osterhoudt, Science Coordinator, North Adams Public Schools

Isiah Thompson, Biology major, Massachusetts College of Liberal Arts

Revisions, Summer 2018

Lauren Mangiardi, English and Elementary Education major, Massachusetts College of Liberal Arts

Project Management: Leslie Rule, Teach to Learn, Massachusetts College of Liberal Arts



License/Copyright Information

This curriculum unit is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0). (CC BY-NC-SA 3.0)



Please see the full text of this license (<http://creativecommons.org/licenses/by-nc-sa/3.0/>) to view all rights and restrictions associated with it.

This unit was developed with funding from the National Science Foundation DOE-IUSE Award No. 1432591

This unit is downloadable at <http://mcla.edu/teach-to-learn>

Under this license, you are free:

to Share — to copy, distribute and transmit the work

to Remix — to adapt the work and incorporate it into your own practice

Under the following conditions:

Attribution — You must attribute the work in the manner specified as “Teach to Learn Attribution” below. You cannot attribute the work in any manner that suggests the program or staff endorses you or your use of the work.

Noncommercial — You may not use this work for commercial purposes.

Share Alike — If you alter, transform, or build upon this work, you may distribute the resulting work only under the same Creative Commons Attribution-NonCommercial-ShareAlike 3.0 license (CC BY-NC-SA 3.0).

Teach to Learn’s Attribution:

© 2018 Teach to Learn. All rights reserved.

Translations:

If you create translated versions of this material (in compliance with this license), please notify principal investigator, Nick Stroud at n.stroud@mcla.edu. The project may choose to distribute and/or link to such translated versions (either as is, or as further modified by Teach to Learn.)





Table of Contents

Unit Plan	Page 5
Tiered Vocabulary List	Page 8
Lesson Feature Key	Page 9
Lessons at a Glance	Page 10
Lesson Plans	
Lesson 1: The Seasons and the Story of a Tree	Page 11
Lesson 2: What Should I Wear?	Page 16
Lesson 3: The Story of Bird and Insects	Page 20
Lesson 4: The Sun in the Sky	Page 26
Lesson 5: The Moon at Night and During the Day	Page 30
Lesson 6: Star Search	Page 34
Unit Resources	
Science Talk and Oracy in T2L	Page 38
List of Unit Resources	Page 41

Unit Plan

Stage 1 Desired Results		
<p>1-ESS1-1. Use observations of the Sun, Moon, and stars to describe that each appears to rise in one part of the sky, appears to move across the sky, and appears to set.</p> <p>1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment.</p> <p>Clarification Statement: Examples of seasonal changes to the environment can include foliage changes, bird migration, and differences in amount of insect activity.</p> <p>K-2:1.1 Demonstrate beginning steps in using available hardware and applications (e.g., turn on a computer, launch a program, use a point device such as a mouse).</p>	<i>Meaning</i>	
	<p>UNDERSTANDINGS <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Patterns of the motion of the sun, moon and stars in the sky can be observed, described and predicted • Seasonal patterns of seasonal changes can be observed, described and predicted 	<p>ESSENTIAL QUESTIONS</p> <p>What patterns exist in the natural world, and how can they be observed in our daily lives?</p>
	<i>Student Learning Targets</i>	
	<p><i>Students will be able to:</i></p> <ol style="list-style-type: none"> 1. Name and give the order of the four seasons 2. Explain the pattern that trees go through as a result of the seasons changing 3. Identify defining characteristics of the seasons 4. Describe how the seasonal change impact what students wear 5. Identify what seasons will have snow and why (temperature) 6. Identify what seasons will have rain and why. (temperature) 7. Explain how the change in weather affect the way birds and insects live 8. Explain why birds migrate 9. Explain the “stages” caterpillars go through 10. Explain that the sun rises in the east and sets in the west 11. Explain how Earth's orbit causes the Earth to have seasons 12. Recognize that the moon’s shape is not the same each night but follows a pattern 13. Predict the movement of the moon across the night sky 14. Identify stars in the night sky 15. Describe the pattern of stars in the night sky 	

Stage 2 – Evidence	
Evaluative Criteria	Assessment Evidence
Pre-unit Assessment (if any)	End of Unit Assessment OTHER EVIDENCE: Exit Tickets Science Journals Class Discussions Worksheets
Stage 3 – Learning Plan	
<p>Possible prior grade level knowledge</p> <p>PreK-ESS1-1(MA). Demonstrate awareness that the Moon can be seen in the daytime and at night, and of the different apparent shapes of the Moon over a month. Clarification Statement: The names of moon phases or sequencing of moon phases is not expected.</p> <p>PreK-ESS1-2(MA). Observe and use evidence to describe that the Sun is in different places in the sky during the day.</p> <p>K-ESS2-1. Use and share quantitative observations of local weather conditions to describe patterns over time. Clarification Statements: Examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month, and relative temperature. Quantitative observations should be limited to whole numbers.</p> <p>Lesson 1: The Seasons and the Story of a Tree Students will learn about the order of the seasons. They will then participate in an activity where they follow a tree throughout the seasons and learn how it changes. Finally, the students will do a short worksheet accompanied by a coloring activity of a tree in each season. Note: <i>The teacher will need to set up the laminated tree in the classroom prior to teaching this lesson.</i></p> <p>Lesson 2: What Should I Wear? Students will continue to learn about the patterns of the seasons through an activity about what to wear and how people interact during each season. The students will be able to identify season based off of what they see in pictures. The</p>	

students will be able to use technology for this lesson. <http://www.bbc.co.uk/wales/bobinogs/games/game.shtml?1>.

Lesson 3: The Story of Bird and Insects. This lesson will show how change in seasons impact birds and insects. Students will investigate the migration patterns and characteristics of birds. Students will also learn why birds sing. Students will also explore the stages insects go through in the different seasons. By the end of this lesson students will have a clear understanding that things changes as the season changes.

Lesson 4: The Sun in the Sky. This lesson focuses on the concept of the sun rising in the east and setting in the west. This idea is understood by using a globe and a flashlight to model how the sun rays hit the Earth. Students will learn about the movement of the earth and the connection between the earth's orbit and season and weather patterns.

Lesson 5: The Moon at Night and During the Day. The lesson begins with a “KWL” activity about the moon. The students will watch a moon landing video as well as the “time to shine” video. During the lesson, each student will create their own “My Moon Book”. The assessment for the lesson is both the final class discussion and the science journal activity.

Lesson 6: Star Search. Students will learn about the patterns of stars in our night sky. Students will understand that the constellations appear to make pictures in the sky. Finally, the students will create their own constellations on a blank canvas and have the opportunity to name their constellation.

Adapted from Massachusetts Department of Elementary and Secondary Education’s Model Curriculum Unit Template. Originally based on Understanding by Design 2.0 © 2011 Grant Wiggins and Jay McTighe. Used with Permission July 2012

Tiered Vocabulary List

Tier 1	Tier 2	Tier 3
Tree Bird Insect Sun Moon Star Shine Twinkle	Draw Label Larva Pupa Rotate Phase Cluster	Seasons Winter Spring Summer Fall/Autumn Temperature Migration Metamorphosis Orbit Satellite Constellation Astronomers

Lesson Feature Key

Lessons in this unit include a number of features to help instructors. This key is a quick guide to help identify and understand the most important features.

Icons



Talk Science icon: Look for this icon to let you know when to use some of the talk science strategies (found in the unit resources of this unit)



Anchor Phenomenon icon: Indicates a time when an anchoring scientific phenomenon is introduced or when an activity connects back to this important idea.

Text Formatting:

[SP#:] Any time you see a set of brackets like this, it indicates that students should be engaged in a specific science or engineering practice.

Underlined text in the lesson: This formatting indicates important connections back to the central scientific concepts, and is useful to note these connections as an instructor, as well as for students.

Callouts

Teaching Tip

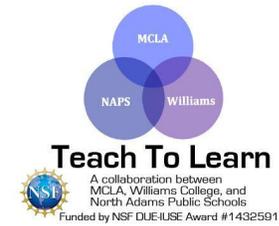
In these call-out boxes, you'll find tips for teaching strategies or background information on the topic.

Student Thinking Alert

Look out for common student answers, ways in which students may think about a phenomenon, or typical misconceptions.

Lessons at a Glance

Lesson Number	Core Activities	Extensions	Tech Integration	Field Work
1	Seasons Book Story of the Tree			Observe a tree nearby over the course of the unit
2	Seasons by Robin Nelson What Clothes to Wear		BBC.com	
3	Looking at Bird Migration and Song Patterns Caterpillar Life Cycle			Look for insects and listen for bird calls outside
4	Rises in the East Sets in the West Four Season			Go outside and observe where the sun is in the sky
5	KWL Activity My Moon Book Moon Video	Moon Phases Book		Ask students to go outside later tonight to observe the moon
6	Opening Star Discussion YouTube Videos Constellation Art Project			Ask students to go outside later tonight to observe or identify constellations



Lesson 1: The Seasons and the Story of a Tree

BACKGROUND

Overview of the Lesson

Students will learn about the order of the seasons. They will then participate in an activity where they follow a tree throughout the seasons and learn how it changes. Finally, the students will do a short worksheet accompanied by a coloring activity of a tree in each season. Note: *The teacher will need to set up the laminated tree in the classroom prior to teaching this lesson.*

Focus Standard

1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment. [Clarification Statement: Examples of seasonal changes to the environment can include foliage changes, bird migration, and differences in amount of insect activity.]

Learning Targets

- I can name and give patterned order of the four seasons.
- I can explain the pattern that trees go through as a result of the seasons changing.
- I can identify defining characteristics of the seasons.

Assessment

Have the students draw and label a tree (in their science journals) make sure they choose one season and then draw the tree to represent what it would look like during that season. Ask the students to write 1-3 sentences about the picture they've created. Allow students to use coloring supplies so they can make an accurate picture. The teacher should check understanding by reviewing the pictures ensuring labels and pictures are correct.



Targeted Academic Language

Tier 1: tree

Tier 2: draw, label

Tier 3: seasons, winter, spring, summer, fall/autumn

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Projector	Classroom Teacher
1	Video: The Season's Song	CMC Website
1	Laminated Bare Tree	Bin
1 per student	Scissors	Classroom Teacher
1-2 per student	Fall-colored construction paper	Classroom Teacher
1-2 rolls	Scotch or Masking Tape	Classroom Teacher
Class Set	Crayons/Markers/Colored Pencils	Classroom Teacher
5 sheets per student	Printer Paper	Classroom Teacher
1 per student	Glue stick/Glue	Classroom Teacher
1	Video: <i>The Seasons of Arnold's Apple Tree</i> by Gail Gibbons	CMC Website
3 pieces	Chart Paper	Classroom Teacher
1	<i>Seasons of Arnold's Apple Tree</i> by Gail Gibbons	Classroom Teacher
1 per student	Science Journal	Classroom Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator



Begin by telling the students that they are starting a new unit about the patterns that occur in our world, seasons, as well as the patterns of the sun, moon, and stars in the sky. Next, ask the students to explain what a pattern is and talk about any patterns they know, with the science fellow listing the discussed patterns on the whiteboard. Now ask, “*Does anyone know the pattern of the seasons?*” If no one answers or a student gives an incorrect answer, write Fall/Autumn, Winter, Spring, Summer in a big circle on the board with arrows connecting the seasons in the proper order. Allow the students to realize that this cycle is also a pattern that repeats every year.

During the Lesson

1. Have the students say the order of the seasons out loud a few times, then have the students participate in the four seasons game. To do this you might need to clear a space for the class to sit in a circle. Assign a quarter of the class Fall/Autumn and have them go sit together, then a quarter should be Winter and sit next to Fall/Autumn, etc... until all the seasons are assigned and the class is sitting in a circle in the order of the seasons. The teacher should then explain the rules of the game. First, the teacher will say “*I am __(insert season)__ and I am leaving.*” Then the season that comes next should all stand up and say “*We are __(the next season)__ and we are coming.*” Then the teacher picks a new season. This game should be played until the teacher is confident that the class knows the order of the seasons before moving to the next part of the lesson.
2. Now you will be showing a video, tell the students to pay special attention to how the trees look in each season because this lesson will focus on the seasons and how trees change through them. Show the video: *The Season’s Song*. It is a song about the seasons, with pictures accompanying the lyrics, that can help the students visualize each season. Once the video is over, go through each of the four seasons asking the class, “*What did you notice were signs of the __season?*” If any incorrect responses are given make sure to correct them, using guided discussion and appropriate prompting, give as many students as possible a chance to respond before moving on.

3. Discuss the differences in sunrise/sunset throughout the four seasons and how this might affect plants and animals. Also discuss how sunlight might affect the weather/temperature during a given season (shorter daylight in the winter means less sunlight, therefore the weather is colder, etc...). This can be repeated, in sections or in its entirety, throughout the lesson if necessary. Some possible questions could include: why do plants grow better in the spring and summer? How does the amount of sunlight affect animals? (hibernation/migration/etc...)...**Once again, this discussion should be repeated (in a modified version) throughout the course of the lesson, and the unit, if students are struggling to understand the core concepts of the unit.**

4. **Seasons Book Activity** - This activity should be started during the lesson, but can be stopped if it takes too long and finished at another time. For this activity, each student will need scissors, 5 plain sheets of printer paper (one cover page and then a page for each season), and coloring tools. Each student will create their own book about the seasons. The teacher/science fellow may want to create a demo book to show the students which would include a cover page with a title and the author's name, inside the book there should be 4 pages (one for each season). For example, on the fall page, have the students write the word Fall and some words they might associate with fall such as leaves, pumpkins, and Halloween, after they have completed the writing portion of the activity they can then color their pages with images that remind them of that particular season. Note: *These can be collected after the lesson to assess the students' knowledge.*

5.  **The Story of the Tree** - As a class, either show a reading or have the classroom teacher read "The Seasons of Arnold's Apple Tree" by Gail Gibbons. There is a video of the book being read on the CMC Website. Pause the reading at the end of each season in the story and ask the students to raise their hands and explain what happened to the tree during that season (it lost its leaves, grew flower buds etc..) and why they think it happened. Try to help them see the connection between the rain in the spring and the flowers that bloom, etc. This will help the students understand the impact the seasons have on the natural world around us. Encourage them to use their science words and the words they have learned, such as autumn, in their response. **[SP-6. Constructing Explanations and Designing Solutions]**



- Classroom Tree** - Note: *The teacher should set up this activity before the lesson, and then should take time to explain the purpose of the tree in before decorating for Fall/Autumn.* Begin by hanging the laminated tree trunk and branches on the classroom wall somewhere it can stay for the entire school year. Explain to the class that the tree will be decorated each season in order to further explore the story of the tree. Take the class outside and have them pick a tree near the school that they will observe before decorating their laminated classroom tree. The students can name the tree, encourage them to observe the tree. Then bring the students inside and pass out fall colored construction paper and scissors for them to cut out leaves and then tape them around the tree to decorate it for fall. When winter comes, take down the leaves and ask -the students what trees look like in the winter. Provide cotton balls to the class to now decorate the tree with “snow” and other signs of winter that the teacher can find. When spring begins bring green construction paper as well as some floral colors to have the students put the leaves back on the tree as well as the flowers blooming on and around it. Lastly, before they leave for summer, decorate the summer tree with full green leaves and a bright sun in the top corner.

Lesson Closing

After the classroom tree has been decorated, have the class sit in the part of the circle associated with their season from the opening seasons game. If the students forget their season, the teacher can reassign them. The circle should again have the seasons in order. The teacher should then explain the rules of the new game. First, the teacher will say “*I am a tree and I have snow on me. What season am I in?*” Then, winter should all stand up and say “*Don’t worry Mr./Mrs. Tree, you are in winter.*” Then the teacher picks a new fact about trees from a different season. This game should be played until the teacher is confident that the class knows which seasons are responsible for which changes in a tree. The class should then participate in a closing discussion in which they review what they have learned.

Assessment

Have the students draw and label a tree (in their science journals) make sure they choose one season and then draw the tree to represent what it would look like during that season. Ask the students to write 1-3 sentences about the picture they’ve created. Allow students to use coloring supplies so they can make an accurate picture. The teacher should check understanding by reviewing the pictures ensuring labels and pictures are correct.

Lesson 2: What Should I Wear?

BACKGROUND

Overview of the Lesson

Students will continue to learn about the patterns of the seasons through an activity about what to wear and how people interact during each season. The students will be able to identify season based off of what they see in pictures. The students will be able to use technology for this lesson. <http://www.bbc.co.uk/wales/bobinogs/games/game.shtml?1>

Focus Standard(s)

1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment. [Clarification Statement: Examples of seasonal changes to the environment can include foliage changes, bird migration, and differences in amount of insect activity.]

K-2:1.1 Demonstrate beginning steps in using available hardware and applications (e.g., turn on a computer, launch a program, use a point device such as a mouse).

Learning Targets

I can describe how the seasonal change affects what they wear.
I can identify what seasons will they will experience snow in and why (temperature).
I can identify what seasons they will experience rain in and why (temperature).

Assessment

In their science journal, have students draw a picture and write 1-3 sentences about their favorite season.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Targeted Academic Language

Tier 1:

Tier 2: seasons, winter, spring, summer, fall/autumn

Tier 3: temperature

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Seasons by Robin Nelson	Bin
1 of each	Laminated, Fall, Spring, Winter, Summer Signs	Bin

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator



Begin this lesson with a think-pair-share activity in which the students discuss what they remember from the last lesson. This discussion should include patterns and the seasons and can be guided by the science fellow or teacher in order to incorporate relevant information from the previous lesson. The teacher will then tell the students to close their eyes, and then then describe a scene: the playground is covered with a new layer of white snow and the cold wind is blowing. When we head out for recess we must first put on our snowsuits, boots, hats, and mittens. The teacher will then ask the students to guess what season it is. After arriving at the correct answer (winter) the teacher will ask the students what clues led them to know that it was winter.

Teaching Tip

If you want, look up videos that have sounds of the seasons in them, have the students listen when they close their eyes and imagine the season and what causes the sounds that they are hearing.

During the Lesson

1. The teacher will read the book, *Seasons*, by Robin Nelson to the students.
2. The teacher will lead a discussion about each season on the board. begin with Winter. Under the word winter write down different activities and clothing people wear during the winter. Ask the students to think of what season comes after winter.
3. Write Spring on the board. Tell the students to close their eyes and envision what changes happen around us in Spring. If you need to guide the discussion by giving clues as you did with winter, do so. Make sure to list what people wear in the spring, activities people do, and what happens to the weather in spring.
4. Next write Summer on the board. Again, list all the ideas students brainstorm during summer. Write down what we wear, activities we do, and what the weather looks like in the summer.
5. Lastly, write Fall on the board. Have the students name all that they can brainstorm about fall. Make sure to write all their ideas under the word Fall.

Lesson Closing

In closing, play *take a guess of which season*; this is meant to be a movement game. Grab the laminated season signs from your bin- these will be posted in different corners of your classroom. Post Winter in one corner, Spring in another, Summer in the third corner, and Fall in the last corner. Explain to the students that you are going to give three clues. When the students think they know what season it is, they are to move to that corner, the teacher may mix up the order and repeat. After the game is complete, have the students return to their seats and discuss what the students learned in today's lesson and how this information relates to what was previously learned, or what the students already knew about the seasons and seasonal changes. The teacher or science fellow should call out some of the following words and then let the students move to the appropriate corner of the room, the words below are just suggestions of what you could call out loud but you can certainly come up with your own examples. For example, call out falling leaves, football, cool air, pumpkins, Halloween- the students should think fall and then should go to the corner where Fall is posted.

Winter-- Mittens, snowsuits, snow, cold air, sleds, ice skating

Spring--Rain, raincoats, sweatshirts, blooming flowers, rain boots

Summer--Hot, bathing suits, shorts, tank tops, flip flops, vacation, swimming



Fall--Wind, cool air, falling leaves, sweater, football, pumpkins, Halloween

Assessment

In their science journal, have students draw a picture and write 1-3 sentences about their favorite season.

Lesson 3: The Story of Bird and Insects

BACKGROUND

Overview of the Lesson

This lesson will show how change in seasons impact birds and insects. Students will investigate the migration patterns and characteristics of birds. Students will also learn why birds sing. Students will also explore the stages insects go through in the different seasons. By the end of this lesson students will have a clear understanding that things change as the season changes.

Prior to teaching the lesson, the science fellows and classroom teacher should review how seasonal changes affect birds and insects.

Focus Standard

1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment.

Clarification Statement: Examples of seasonal changes to the environment can include foliage changes, bird migration, and differences in amount of insect activity.

Learning Targets

I can explain how the change in weather affect the way birds and insects live.

I can explain why birds migrate.

I can explain the “stages” caterpillars go through.

Assessment

What season do birds migrate in? Why? How do seasons affect insects? Students will also be assessed based on participation in class discussions and activities.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Targeted Academic Language

Tier 1: bird, insect

Tier 2: larva, pupa

Tier 3: migration, metamorphosis

RESOURCES AND MATERIALS

Quantity	Item	Source
	Life Cycle of the Goldenrod Ball Gall Fly (Excerpt from Hands on Nature: p. 150-151)	Binder
1 Class Set	Bird Song Cards	Bin
	Bird Song Card Directions (Hands on Nature p. 166)	Binder
	Life of Insects - Attenborough: Life in the Undergrowth - BBC	CMC Website

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Ask the students what they remember from the last lesson. Have a quick discussion about what people do in different seasons. Allow the students to discuss how they change the types of clothes they wear during different season. Ask students, *“Do birds and insect change throughout the seasons like people do?”*. Then ask *“What are those changes?”*. After the discussion, tell the class that today they will be learning more about the changes that birds and insects go through.

During the Lesson

1. Looking at Bird Migrations and Song Patterns:

- a.  Ask students: “How do you think the amount of daylight affects plants and animals?” After hearing the students’ answers, ask a follow up question, “Do seasons affect birds and insects?” explain that “based on the season, the days can have more sunlight than others.” Ask the students: “Do you see a lot of bugs in the winter?” After hearing the students’ answers, tell the students that in the winter time bugs fly away to warmer places or dig deep underground to stay warm.
- b. Ask students, “What do birds eat?”. Once the students have shared some of their ideas, explain that in the winter time there is very little food for the birds. Continue by asking the students if they have ever seen birds flying in “V” shape before? Ask them if they know why birds fly in that formation. After listening to the students’ answers explain to them that when the birds are flying like that they are MIGRATING! Ask the students what they know about migration. Share with them that migration can be triggered by a combination of changes in day length, lower temperatures, changes in food supplies, and genetic predisposition. Explain to the students that migration is something that comes naturally to birds and is important because it is what keeps birds and insects alive.
- c. **Bird Songs:** Tell the class that “WINTER IS OVER!”. Explain to the class as birds return from their migration they sing joyful songs to affirm that winter is over, now that winter is over and spring is here, the insects and flowers will come back. Birds survive better in hot places so spring and summer are their favorite seasons. So during this time birds will sing songs and each bird has a different song it will sing. Each bird has different times of the day that it will sing its song. Ask the students “Why do you think birds do this?” After hearing the students’ answers, explain that it’s mostly the male birds who sing as they attempt to attract mates and keep others away from their territory. Now that the students understand why birds sing different songs, the class will now sing the different bird songs.
- d. **Bird Songs:** Grab the bird song cards from the bin and distribute amongst the class. Depending on how big the class is put the students in groups of 2-3. Give each group a bird song card, on the card will be the time the bird sings and what the song sounds like. Allow the students to practice singing their songs with their group. Now bring the class

back together and organize the students based on the times when their birds sing (organize the students in a line starting with the birds who sing in the morning and ending with the birds that sing the latest in the day). Tell the students they will now be singing their songs in the order the birds would. Let the students sing their songs 2 or 3 times. You can let the whole class sing all their songs at the same time to hear what it would sound like.

- e. **Optional Activity:** During the lesson let the students listen to some bird sounds. These videos can be found easily on the internet. Look up birds that are local to the schools location so that they can relate to what they are hearing.

This is an optional breaking point for the lesson.

2. Insect Hunt

- a. Ask the students *“Can someone tell me what they know about insects?”* Allow the class to give examples of what they believe insects are and the different kinds of insects they know about. Ask them *“Can the seasons affect insects?”* After the class has explained what they know about insects ask them if they want to go outside and search for insects. Now head outside as a class and give the students 10 minutes to try and find insects. If students are having a hard time finding insects you can tell them to look in the air, under rocks, in bushes, or on the grass. Once students have had time to explore head back to the classroom and discuss what the students saw and observed. Ask the students if they were able to find any insects and if it was easy or challenging. Then ask students if they think it would be easier to find insects in the summer or the winter, after hearing their answers explain that during colder season insects and birds migrate to warmer locations.
- b. **What is a Gall?** Ask students if they know what a gall is (most will not know what this is), explain that a gall is an abnormal growth that occur on leaves, twigs, roots, or flowers. Most galls are caused by stimulation of plant cells due to feeding or egg-laying by insects. Now hold up the diagram of the Life Cycle of the Goldenrod Ball Gall Fly and explain the life cycle to the students. Focus on spring and that this is the season during which lots of excitement happens and the cycle really begins. In this season, the fly will lay its eggs in the plant. By mid summer the gall has formed and inside is the baby larva. The gall is like a home for the egg, and the larva will stay inside the gall all winter and will eat away at the inside of the gall. Eventually the insect will make an exit hole, this exit hole is for larva to squeeze out of and fly away. After the exit hole is made, the larva will start to pupate. Pupate is when the



larva will wrap itself up. Then when winter is over the larva will come out the pupa, go through the exit hole and fly away.

- c. Watch the video at <https://www.youtube.com/watch?v=oE7sGyCBWr8> which explains the link between insects, seasons, and galls.

Lesson Closing

To reinforce learning ask the students:

“What are the four stages of a caterpillar’s life?”

“What is migration?”

Why do birds do migrate and when?”

Assessment

What season do birds migrate in? Why? How do seasons affect insects?

Students will also be assessed based on participation in class discussions and activities.



Lesson 4: The Sun in the Sky

BACKGROUND

Overview of the Lesson

This lesson focuses on the concept of the sun rising in the east and setting in the west. This idea is understood by using a globe and a flashlight to model how the sun rays hit the Earth. Students will learn about the movement of the earth and the connection between the earth's orbit and season and weather patterns.

Focus Standard(s)

1-ESS1-1. Use observations of the Sun, Moon, and stars to describe that each appears to rise in one part of the sky, appears to move across the sky, and appears to set.

1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment.

Clarification Statement: Examples of seasonal changes to the environment can include foliage changes, bird migration, and differences in amount of insect activity

Learning Targets

I can explain that the sun rises in the east and sets in the west.

I can explain how Earth's orbit causes the Earth to have seasons.

Assessment

Exit Ticket Questions

1. When the Earth is closest to the sun it is _____.
2. When the Earth is farthest from the sun it is _____.
3. The sun rises in the _____ and sets in the _____.

WIDA Language Objectives

Dependent on the needs of your ELL students.

Targeted Academic Language

Tier 1: sun, seasons

Tier 2: rotate

Tier 3: orbit

RESOURCES AND MATERIALS

Quantity	Item	Source
1	"I'm So Hot" Video	CMC Website
1	Globe	Bin
10-12	Flashlight	Bin
1	<i>The Reasons for Seasons Book</i>	Bin
1 per student	Exit Ticket	Binder (Classroom Teacher to Copy)

****Items in bold should be returned for use next year***

LESSON DETAILS

Lesson Opening/ Activator



The teacher and science fellow should review the book before the lesson. The book contains more information than the students' needs to know but connects well to the concept of seasons. Read through the book to know what should be emphasized when reading it to the class. Begin this lesson with a think-pair-share activity in which the pairs discuss everything they know about the sun before sharing their ideas with the class. Then ask the students, "*Why is the sun important?*", "*How does the sun help us tell time?*" Tell the students that the sun helps us to tell time, we know when the day is over because it is dark, and we know when the day begins because the sun begins to rise. Play the video "*I'm So Hot*". After the video, ask the students if they learned anything new or interesting about the sun from the video. If necessary, play the song again for the students.

During the Lesson

- Sun Rises in the East and Sets in the West:** Start this activity by asking the class, "*Has anyone ever heard the saying the sun rises in the east and sets in the west? Does anyone know what that means?*" Turn off the lights in the classroom so it is dark. Take out a globe and a flashlight to demonstrate how the sun rises in the east and sets in the west. Have a student come up and shine the flashlight on the United States. Have another student come up to the front of the classroom and spin the globe, slowly counterclockwise. While the students are doing this, ask the class, "*Is the sun always hitting the United States?*" The answer should be NO! Now ask, "*If the sun is not hitting the United States what time of day is it?*" the answer should be night time. Explain to the class that as the Earth spins, the sun shines on one half of the Earth that half is experiencing day time while the other half of the Earth is experiencing night time. In the morning, the Earth spins back to where the sun is shining. It will keep spinning until it stops facing the sun and then it will be night again, that is why we say the sun rises in the east and sets in the west,
- Understanding Seasons:** Now review the four seasons and ensure students are clear on the differences between each. After the students have named the four seasons ask, "*Why do we have seasons?*" have students share answers. Now read



The Reasons for Seasons book, when finished, ask the students, “*What did you learn from the book?*” once the students have answered move onto the next activity.

3. **Acting as the Sun and Earth:** Have the students pair up and give each group a flashlight. Tell the class they will now be acting out how the Earth rotates around the sun using their own bodies. There will be one student holding the flashlight (student 1). They will shine it on the other student (student 2) who will rotate around the sun (or student 1) (remind students not to shine the light in anyone’s eyes). Student 2 will move and Student 1 will remain still. Have the students take turns being the sun and earth, be sure to turn the classroom lights off. After a few minutes ask the students if the light always hit the same spot? After hearing the answers continue by asking if the students felt the heat from the flashlight more at certain times during their orbit. They should say yes, explain that this is why it is hotter on some places on Earth than others during the year because as the Earth moves some parts are facing the sun and some are not. Be sure to connect this concept of sunlight and the Earth’s orbit to the seasons and ensure student understanding.

Assessment

Exit Ticket Questions

1. When the Earth is closest to the sun it is _____.
2. When the Earth is farthest from the sun it is _____.
3. The sun rises in the _____ and sets in the _____.

Lesson 5: The Moon at Night and During the Day

BACKGROUND

Overview of the Lesson

The lesson begins with a “KWL” activity about the moon. The students will watch a moon landing video as well as the “time to shine” video. During the lesson, each student will create their own “My Moon Book”. The assessment for the lesson is both the final class discussion and the science journal activity.

Focus Standard

1-ESS1-1. Use observations of the Sun, Moon, and stars to describe that each appears to rise in one part of the sky, appears to move across the sky, and appears to set.

Learning Targets

I can recognize that the moon’s shape in the sky is not the same each night but follows a pattern.
I can predict the movement of the moon across the night sky.

Assessment

Students will be assessed discussions as well as an exit ticket.

WIDA Language Objectives

(Dependent on the needs of your ELL students.)

Targeted Academic Language

Tier 1: moon

Tier 2: phase



Tier 3: orbit, satellite

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Projector	Classroom Teacher
1	Video, <i>Neal Armstrong—First Moon Landing</i>	CMC Website
1	Video, <i>Time to Shine</i>	CMC Website
1	Large Chart Paper	Classroom Teacher
1 copy per student (6 pages per copy)	My Moon Book Handout	Binder
1 Class Set	Markers/Crayons/Colored Pencils	Classroom Teacher
1	http://www.moonconnection.com/moon_phases_calendar.phtml	Classroom Teacher
1 per student	Moon Phase Book (Optional Extension Activity)	Binder
1 per student	Exit Ticket	Binder (Classroom Teacher to copy)

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Begin with a review of the previous lesson. Be sure that students recall the sun moving across the sky throughout the day because this lesson will focus on the moon's movement which is similar. Ask students, *"What is the biggest and usually brightest thing you see in the night sky?"*. This should yield the moon as the answer, but the teacher should listen to other responses as well such as stars or the sun and try to explain how those might not be the answer. (The sun isn't out at night and stars do not appear bigger than the moon.) Bring out a piece of chart paper and start a KWL chart. Ask the students to tell you things they know about the moon and write them down. Then ask the students what they might like to learn about the moon for the "Want to Know" part of the chart. **[SP-1. Asking Questions and Defining Problems.]** End the activity by asking the students *"Do you think a person has ever been on the moon?"* Once someone answers yes, the teacher can introduce the following video as footage from the very first human moon landing. If the students need any more excitement for the video, the teacher could give minor historical background saying that this was such a big event that everyone stayed home to watch on their TVs when it happened in 1969. Then show the following video *Neal Armstrong—First Moon Landing*.

During the Lesson

1. **Class Discussion** – Begin class with a discussion about the video. Have the students share their observations with the class. The teacher can ask probing questions to get this started, such as *"What did the people look like when they walked on the moon?"* *"What do you think the moon is made of?"* *"Was there any water on the moon?"*
2. **Moon Book (taken from Kristen Smith)** – Students will now create their own books about the moon. Make sure each student has access to a pair of scissors and something to color with before beginning. Hand each student the six pages from the My Moon Book handout. The pages are numbered so the students should read each page as they color the book. Once the books are complete read the story aloud to the entire class. The teacher should highlight the words *satellite and orbit*. They should also highlight the moon rising in the east and setting in the west on page seven and connect this back to the sun and the second learning objective.



3. **“Time to Shine” Moon Video.** Show the *Time to Shine* video, ask the students to talk about what they learned from the video. Make sure that the discussion touches on 0:55 when the moon sings about looking different each night. Ask the class for volunteers to draw some shapes they have seen the moon take in the night sky. Then, pull up the lunar calendar website http://www.moonconnection.com/moon_phases_calendar.phtml on the projector and show the students the pattern that the moon go through. This is the first learning objective so be sure that the class understands the pattern. **[SP-4. Analyzing and Interpreting Data]**. If any students mention having observed the moon during the day, you can go back to ~1:13 in the video where the robots say they can see the moon during the day and the night.

Extension Activity

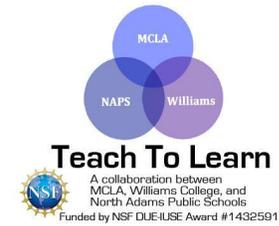
If time permits or the teacher would like to extend the lesson, there is another book from the same creator as the My Moon Book that focuses on the phases of the moon. The required materials are the same for the My Moon Book.

Lesson Closing

Bring the class together to review the KWL chart. Fill out the “L” part of the chart with what the students learned today. Have the students participate in a think-pair-share activity to brainstorm things they learned and then go around the class and have each pair name one or two things. Once everyone has participated, have the students fill out the exit ticket question. The teacher should use this discussion and the exit ticket as the assessment for the lesson.

Assessment

Students will be assessed discussions as well as an exit ticket.



Lesson 6: Star Search

BACKGROUND

Overview of the Lesson

Students will learn about the patterns of stars in our night sky. Students will understand that the constellations appear to make pictures in the sky. Finally, the students will create their own constellations on a blank canvas and have the opportunity to name their constellation.

Focus Standard

1-ESS1-1. Use observations of the Sun, Moon, and stars to describe that each appears to rise in one part of the sky, appears to move across the sky, and appears to set.

Learning Targets

I can identify stars in the night sky.

I can describe the pattern of stars in the night sky.

Assessment

Students will be assessed on the classroom discussion and the drawing of constellations in their science journals.

WIDA Language Objectives

(Dependent on the needs of your ELL students)

Targeted Academic Language

Tier 1: star, shine, twinkle

Tier 2: cluster

Tier 3: constellation, astronomers

RESOURCES AND MATERIALS

Quantity	Item	Source
25	10"x10" white canvas boards	Bin
25	Pieces of black construction paper	Bin
300	Foil star stickers	Bin
1	Video, <i>I Want to Know</i>	CMC Website
1	Video, <i>Constellations Connect the Dot</i>	CMC Website
1	https://www.nasa.gov/image-feature/goddard/2016/hubble-sweeps-scattered-stars-in-sagittarius	Classroom Teacher
1 container per class	Black and Dark Blue Paint	Bin

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Begin the lesson by asking the students if they have ever heard the song, *Twinkle, Twinkle Little Star*. The teacher will draw a star on the board and have the students recite the song altogether. The teacher will then ask the students, "Have you ever looked up in the night sky and seen a star?" The teacher will allow the students to answer and then ask, "What do you know about stars?" This is an opportunity to see what the students know about stars.

During the Lesson

1. Begin the lesson by asking the students if they have noticed any patterns or pictures that the stars in the sky make. Tell the students that patterns of stars are called *constellations*. Explain that constellations are patterns in the sky that create a picture.
2. Play the video, “*I Want to Know*” after watching the video ask the students, “*Can you tell me how you would describe a star?*” After a quick discussion about the first video the teacher should play the video, <https://www.youtube.com/watch?v=1sZ15SueS9w-> *Constellations Connect the Dot*. This will serve as a Segway into the art activity later on in the lesson.
3. Ask students, “*What is a constellation? Have you ever seen a constellation in the night sky?*” The teacher will guide the students through the discussion. Always refer back to the idea that constellations are stars that create a pattern.
4. The teacher or science fellow should project a picture of the night sky at the front of the class, <https://www.nasa.gov/image-feature/goddard/2016/hubble-sweeps-scattered-stars-in-sagittarius>, ask, “*What do you notice about the stars in this picture?*” listen for answers that include: some stars look brighter, I see different colors, I notice different patterns.
5. Tell the students they are going to paint their own constellation. Each student will get a 10x10 blank canvas and some black and deep blue paint. First have students paint their entire canvas like a dark night sky. Some students may choose to paint the whole sky black while others may choose to add some blue to their canvas.
6. While the first layer of sky is drying, teacher will hand the students a piece of black construction paper and 12 foil star stickers. The teacher will instruct the student to create their own constellation on the black construction paper using up to 12 stars. The teacher will tell the student that once all canvases are dry they will then paint their constellation

Teaching Tip

Project some pictures of real constellations for the students to see before they make their own.



(groups of stars) onto their canvas. The teacher will hand out a small amount of yellow and white paint for the students to make their constellation pictures on the canvas.

7. Students can share their painting and tell what they named their constellation.

Assessment

Students will be assessed on the classroom discussion and the drawing of constellations in their science journals.



Science Talk and Oracy in T2L Units

Science talk is much more than talking about science. In line with the science and engineering practices, students are expected to make a claim that can be supported by scientific evidence. The MA STE Standards (and the NGSS) value the importance of engaging in an argument from evidence. NGSS defines how this practice takes form in the real world: *“In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated.”*

Students are asked to participate in articulate and sensible conversations in which they can communicate their ideas effectively, listen to others to understand, clarify and elaborate ideas, and reflect upon their understanding. These forms of talk can be developed using scaffolds such as the A/B Talk protocol (below) and strategies for class discussions (from the Talk Science Primer, link below). Oracy is developed in the physical, linguistic, cognitive, and social-emotional realms; each of these realms can be expanded upon over time in order to develop a thoughtful speaker. Being able to display appropriate body language, use proper tone and grammar, be thoughtful and considerate thinkers, and allow space for other thoughts and opinions are all important facets of oracy to work on and through with students. Incorporating the appropriate scaffolding is an important aspect of fostering these skills. Techniques for teaching effective science talk often include modeling, discussion guidelines, sentence-starters, and generating roles, while gradually putting more responsibility on students to own their thinking and learning.

Part of creating a safe school environment for students is allowing them a space that is comfortable enough for them to express ideas and ask questions, while being validated for their thoughts and questions; students should be feel comfortable and confident when speaking and listening for understanding. Effective talk is an important part of being an active, intelligent

member of a community and society. Successful development in oracy is important for future employability and general well-being of adults.

The following resources should be helpful examples of how to employ effective use of progressive oracy and science talk in your classrooms.

- Oracy in the Classroom: <https://www.edutopia.org/practice/oracy-classroom-strategies-effective-talk>
- Science Talk Primer: https://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf

A/B Talk Protocol

Adapted from <https://ambitioussciencelearning.org/ab-partner-talk-protocol/>

 <p>1. Share your ideas</p> <p>Partner A</p> <ul style="list-style-type: none"> • I think ____ happened because... • Evidence that supports my idea is... • The activity we did with ____ helps me know more about ____ because... • One thing I'm wondering about is... 	<p>2. Listen to Understand</p> <p>Partner B</p>  <ul style="list-style-type: none"> • I heard you say _____. What makes you think that? • I heard you say _____. What if _____? • Can you explain the part about _____ again? • What do you mean when you say _____?
---	---

<p>3. Clarify and elaborate</p> <p>Partner A</p>  <p>Answer partner's questions or ask for clarification in order to understand a question.</p>	<p>4. Repeat steps 2 & 3 until all questions are answered</p>  
<p>5. Switch roles and repeat steps 1-4</p>  	<p>6. Reflect on your understanding in writing</p> <ul style="list-style-type: none"> • My idea about _____ changed when my partner said _____. • I will add _____ to my idea about _____ because... • I still have questions about... • I may be able to answer my question(s) if I could investigate _____.

List of Unit Resources

****items in bold should be returned for use next year****

Lesson 1

Quantity	Item	Source
1	Projector	Classroom Teacher
1	Video: The Season's Song	CMC Website
1	Laminated Bare Tree	Bin
1 per student	Scissors	Classroom Teacher
1-2 per student	Fall-colored construction paper	Classroom Teacher
1-2 rolls	Scotch or Masking Tape	Classroom Teacher
Class Set	Crayons/Markers/Colored Pencils	Classroom Teacher
5 sheets per student	Printer Paper	Classroom Teacher
1 per student	Glue stick/Glue	Classroom Teacher
1	Video: <i>The Seasons of Arnold's Apple Tree</i> by Gail Gibbons	CMC Website
3 pieces	Chart Paper	Classroom Teacher
1	<i>Seasons of Arnold's Apple Tree</i> by Gail Gibbons	Classroom Teacher
1 per student	Science Journal	Classroom Teacher

Lesson 2

Quantity	Item	Source
1	Seasons by Robin Nelson	Bin
1 of each	Laminated, Fall, Spring, Winter, Summer Signs	Bin

Lesson 3

Quantity	Item	Source
	Life Cycle of the Goldenrod Ball Gall Fly (Excerpt from Hands on Nature: p. 150-151)	Binder
1 Class Set	Bird Song Cards	Bin
	Bird Song Card Directions (Hands on Nature p. 166)	Binder
	Life of Insects – Attenborough: Life in the Undergrowth – BBC	CMC Website

Lesson 4

Quantity	Item	Source
1	“I’m So Hot” Video	CMC Website
1	Globe	Classroom teacher
10-12	Flashlight	Bin
1	<i>The Reasons for Seasons Book</i>	Bin
1 per student	Exit Ticket	Binder (Classroom Teacher to copy)

Lesson 5

Quantity	Item	Source
1	Projector	Classroom Teacher
1	Video, <i>Neal Armstrong—First Moon Landing</i>	CMC Website
1	Video, <i>Time to Shine</i>	CMC Website
1	Large Chart Paper	Classroom Teacher



1 copy per student (6 pages per copy)	My Moon Book Handout	Binder
1 Class Set	Markers/Crayons/Colored Pencils	Classroom Teacher
1	http://www.moonconnection.com/moon_phases_calendar.phtml	Classroom Teacher
1 per student	Moon Phase Book (Optional Extension Activity)	Binder
1 per student	Exit Ticket	Binder (Classroom Teacher to copy)

Lesson 6

25	10"x10" white canvas boards	Bin
25	Pieces of black construction paper	Bin
300	Foil star stickers	Bin
1	Video, <i>I Want to Know</i>	CMC Website
1	Video, <i>Constellations Connect the Dot</i>	CMC Website
1	https://www.nasa.gov/image-feature/goddard/2016/hubble-sweeps-scattered-stars-in-sagittarius	Classroom Teacher
1 container per class	Black and Dark Blue Paint	Bin