



Science Unit: *Space*

Lesson 5: *Twinkle, Twinkle Little Star*

School year: 2006/2007

Developed for: Sexsmith Elementary School, Vancouver School District

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Grade level: Presented to grades 2 and 3, appropriate for grades 2-6 with age appropriate modifications.

Duration of lesson: 1 hour and 20 minutes

Objectives

1. Students will be able to recognize the Big Dipper, Little Dipper, Orion, Cassiopeia and Southern cross constellations
2. Students will be able to explain why the constellations we see vary depending on the observers position on the globe
3. Students will be able to explain why some constellations we see are seasonal

Background Information

Human kind has been studying the stars for millennia. The stars movements across the sky and their brightness helped develop navigation systems and to unravel the movements of other celestial bodies, like the planets of the solar system. Ancient stargazers observed many of the same stars we do today. The ancients named clusters of stars according to their mythology, and these names persisted through the modern ages.

A constellation is an identifiable cluster of stars that make a given shape. Constellations are not real, that is to say, the stars do not really form that shape. The first observers of the sky thought that the stars in a constellation when connected resembled a shape that was familiar to them, and so they named it. This allowed them to map the movement of the stars throughout the seasons, which helped the development of nocturnal navigation.

Today stargazing is mostly a hobby. But stargazing can prove very useful if one is lost. The stars are wonderful for navigation. By looking at the sky one could easily pinpoint north or south. Polaris, the North Star, always point north and long arm of the Crux, the Southern Cross, always points south.

Stars move across the night sky throughout the night, they also move 'off' the sky depending on the season, or might not be visible at all from a given location. This might become easier to understand if we remember that it is not the stars that are moving, but the Earth. The movement of the stars throughout the night sky is easily explained by the Earth's rotation around its own axis. Now imagine Earth on its orbit around sun and all around it, but very far away, are many stars we see. Some of these stars will be located directly underneath the planet, thus only possible to be viewed from the southern hemisphere; while others will be 'hanging' above the planet, so only viewed from the northern hemisphere. In a way, we cannot see the stars underneath the Earth from the north, because our planet is in the way. To explain the seasonal appearance of different stars, imagine that during summer we can see stars A and B. As the Earth moves 180° around the sun, going from summer to winter, stars A and B are now located behind the sun, and therefore only visible during the day when the Earth faces the sun. That is why they would disappear from the night sky. Instead other stars will be visible, and these are the stars that we could not see during the summer.



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The Big Dipper, the Little Dipper, Orion and Cassiopeia are some of the most well known northern constellations. The North Star is part of the little dipper constellation, and two stars in the big dipper constellation align with the North Star. The Orion constellation has a peculiar cluster of 3 stars in line, called Orion's belt, and two of the brightest stars in the sky, Betelgeuse and Rigel, are part of Orion's right shoulder and left foot. Cassiopeia or the Lady in the chair is shaped like a 'w' and is located right in front of Polaris.

Vocabulary

<u>Constellation:</u>	A group of stars that form a given shape and appear to move together in the sky
<u>Asterism:</u>	The most recognizable part of a constellation (eg. Big Dipper)
<u>Hemisphere:</u>	Half of a sphere. Half of the planet when divided on the equator, making northern and southern hemispheres
<u>Mythology:</u>	A collection of myths created by ancient civilizations

Materials for this lesson

- Black film canisters
- Constellation patterns sheet
- Mysterious dots worksheet
- Make your constellation worksheet
- Large posters of constellations
- 1 balloon
- Sheets of white card paper
- Copies of Star Finder sheets
- Globe
- Scissors
- Glue
- Exactum knife

In the Classroom

Introductory Discussion (Hook)

1. Review the material learned up to this lesson - have the students make charades for the class
2. Ask the students if they know the name of any constellations
 - Do you have a favourite one?
 - Lead them into a discussion of the names of different constellations
 - Introduce the vocabulary and the difference between asterism and constellation

Science Activity/Experiment

Activity Title: Constellation in a canister (Canright, Shelley (NASA Editor) – NASA Activities)

Purpose of Activity: shows that the constellations' lines are imaginary and that the picture they form are not always in the orientation we see drawn in a book.

Preparation:

1. Make sets of constellations using the black canisters and the constellation patterns. The sheet has patterns for many constellations, when this lesson was delivered we only used 5 constellations: Big dipper (asterism), Little Dipper, Cassiopeia, Orion and the Southern Cross.
2. Use the sheet to make holes on the bottom of the canister, such that one could remove the canister lid and see light poking through the holes.
3. Number the canisters so everyone will draw the different constellations in the same order



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Activity Instructions:

1. Give a set of 5 constellations to a group of students and 1 mysterious dots worksheet per student.
2. Ask them to remove the lids, look through the opening and draw the dots on the box number corresponding to the canister number.
3. Ask them to connect the dots how they would like to in pencil
4. Draw the constellation dots, one at a time. Give them the constellation's name and show them how the dots are traditionally connected. It is useful to end with the Southern Cross to get them thinking about the why we don't see it here in the northern hemisphere.
5. Discuss the differences between the traditional drawing and the way they connected the dots. Explain about mythology
 - o If you had discovered this constellation how would you connect the stars?
 - o What would you name it?
6. Show them the posters of the constellations they just learned about – point out the large stars and ask them why those stars might be drawn bigger
7. End with the Southern Cross, but instead of showing a poster of the constellation, show the flags of Australia, Papua New Guinea and Brazil.
 - o What is common between all these flags? (they all have stars)
 - o Are these stars in particular pattern? (all these flags have the Southern Cross on it)
 - o Which countries do these flags belong to? (tell them the ones they don't know – point their location on a globe)
 - o What is common between these countries? Where are they in the globe? (all in the southern hemisphere)
8. Lead a discussion as to why we cannot see the Southern Cross in North America.

Science Activity/Experiment

Activity Title: A Circle of Stars

Purpose of Activity: To show how the rotation of the Earth makes the stars appear to move across the sky, how seasons affect the stars we can see, and why different constellations can only be seen in the southern or northern hemisphere

Activity Instructions:

1. Organize the students in a ring with the teacher in the centre.
2. Randomly pick some students to stand up and some to sit down.
3. Inflate a balloon and tell them that the balloon is Earth, you (the teacher) is the sun and they are stars we see from Earth
4. With a marker draw N for north on the top of the balloon and S for south at the bottom.
5. Make a mark on the balloon where the city you are in (in our case Vancouver) would be located, one around the equator (maybe a monkey in a jungle?), one for a polar bear in the Arctic, and another for a penguin in Antarctica.



SCIENTIST IN RESIDENCE PROGRAM

6. Explain that the stars sitting down are stars that are 'floating' below the Earth, and the stars standing up are stars 'floating' above the Earth.
 - o Which are stars only the penguin would see? (sitting children)
 - o What about the polar bear? (standing children)
7. Hold the balloon in front of you and slowly rotate around the ring, and also rotate the balloon around its axis to simulate day and night.
8. Explain that one full rotation around the ring represents an entire year
 - o In one year, which stars did the polar bear see? What about the penguin?
 - o Why? (the earth is in the way, so the sitting/ standing stars cannot see the polar bear/ penguin)
 - o Which stars did the monkey see? (all)
 - o Why? (monkey is in the equator, so there is nothing in the way)
9. Remind them that a full rotation around the ring represents an entire year
 - o What happens on Earth that takes an entire year to repeat? (seasons)
10. Divide the circle into the four seasons – starting at summer move towards winter. It's best to do one hemisphere at a time.
 - o During the summer, which stars can the polar bear see?
1. Move to winter position
 - o Which stars can the polar bear see?
 - o Can the bear see the summer stars (use the kid's names)? Why? (the sun is in the way)
2. Repeat the cycle to include all seasons, and then do the same with the southern hemisphere.

Science Activity/Experiment

Activity Title: Making a Star Finder (Engaging Science, Pacific Space Centre)

Purpose of Activity: Give the students an idea of constellations can be seen in the northern hemisphere at different times of the night and during an entire year.

Activity Instructions:

1. Give each student a blank card paper and one star finder holder sheet (best if copied on card paper) – ask them to match and hold the card together and cut around the perimeter.
2. Go around the room making a slit with an exactum knife so they can easily cut the oval part
3. Staple the cut cards together
4. Give each student: a simple star wheel, a complex star wheel, and a blank sheet of card paper with a circle the same size as the star wheel drawn. Instruct them to cut each circle – remind them not to cut the months off the star wheels.
5. Glue the one star wheel to each side of the card paper circle and place it in star finder holder.

Scientific Report: write about the constellations on their space journal – this was not included in the time allotted.



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Closure: Give the students the 'Make your own Constellation Worksheet'.

References

1. http://www.nasa.gov/audience/forkids/activities/A_Constellation_in_Canister.html. Jim Wilson, NASA Editor. Hosted by NASA [Constellations in a canister activity instructions]
2. Engaging Science, Pacific Space Centre. Making a Star Finder Activity. Science World Activity Binder.
3. <http://www.middleschoolscience.com/shoeboxplanetarium.htm>. Legg Middle School Website. Activity adapted from: *Exploring Space*. New York: Macmillan/McGraw-Hill School Publishing Co., 1995. [shoebox planetarium instructions]

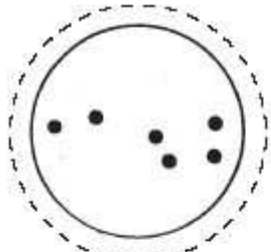
Teacher Assessment of Learning

1. Are the students able to recognize the Big Dipper, Little Dipper, Orion, Cassiopeia and the Southern Cross?
2. Do the students understand why we have constellations?
3. Do the students understand why we cannot see all the stars visible from Earth in only one hemisphere?
4. Are the students able to explain why the constellations we see vary depending on the season?

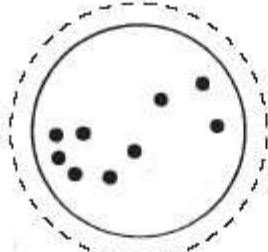
Extension of Lesson Plan

1. Make a shoebox planetarium. Cut a slit along one small side of the shoebox lid, and another large rectangular hole (big enough to fit the constellation card) on the same small side of the shoebox. Poke a small viewer on the opposite side. Using black card paper, poke different size holes corresponding to the stars in a constellation. Place the lid on the shoebox and fit the constellation card through the slit, such that it sits in front of the rectangular opening. View through the viewfinder.
2. Build a planetarium hat – Activity instructions in "[Make It Work Space](#)", Haslam, (J520 H350)

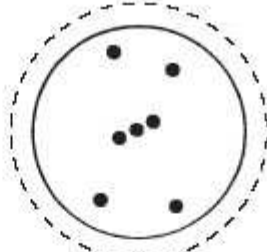
Print this pattern page. Carefully cut around each circle.



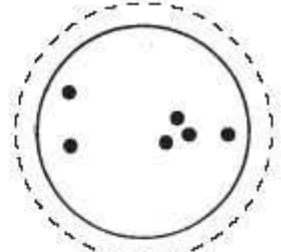
URSA MAJOR,
the Great Bear



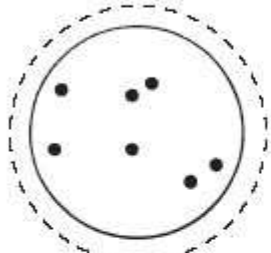
SCORPIUS,
the Scorpion



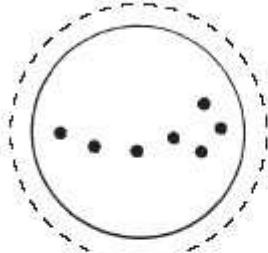
ORION,
the Hunter



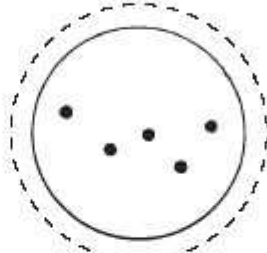
TAURUS,
the Bull



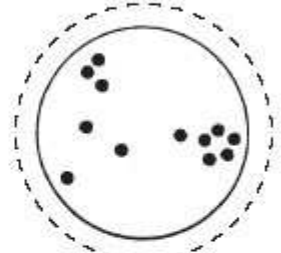
PEGASUS,
the Flying Horse



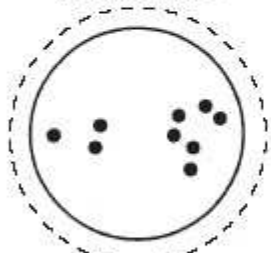
URSA MINOR,
the Little Bear



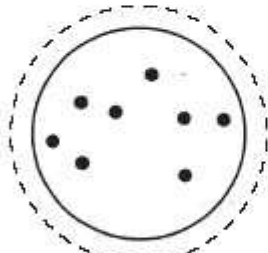
CASSIOPEIA,
the Queen



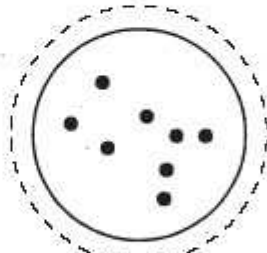
PISCES,
the Fishes



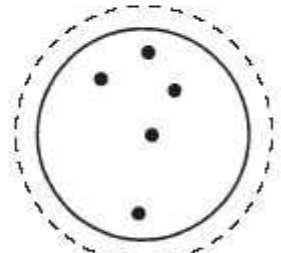
LEO,
the Lion



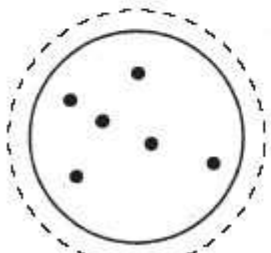
SAGITTARIUS,
the Archer



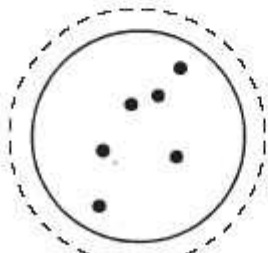
GEMINI,
the Twins



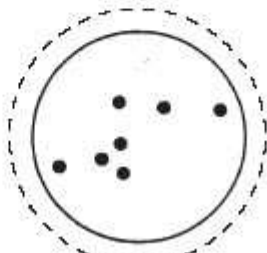
BOOTES,
the Herdsman



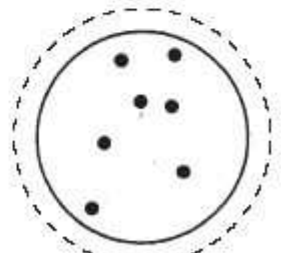
CYGNUS,
the Swan



PERSEUS



CANIS MAJOR,
the Big Dog



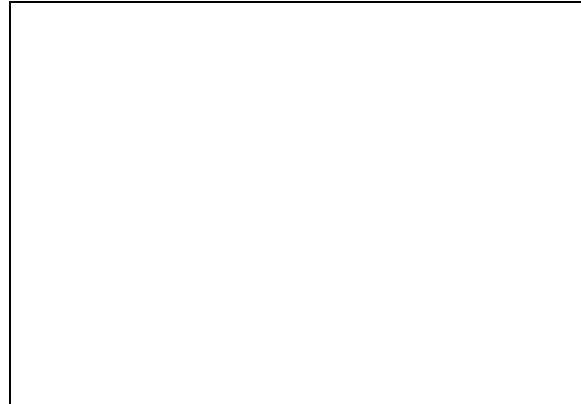
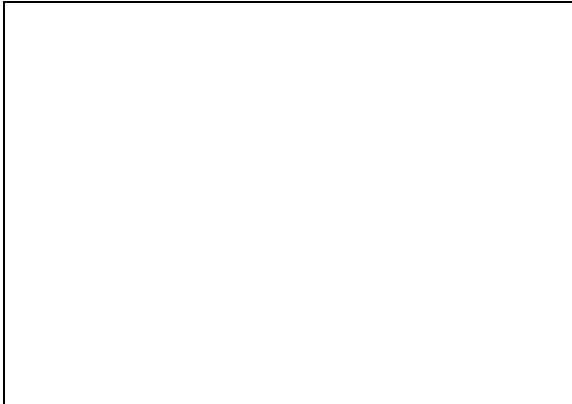
HERCULES

Name: _____

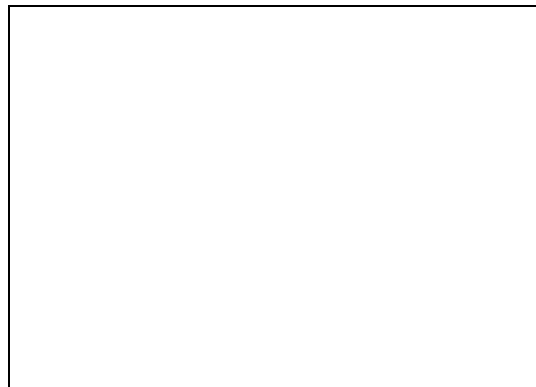
Mysterious Dots Activity

Can #1: _____

Can #2: _____

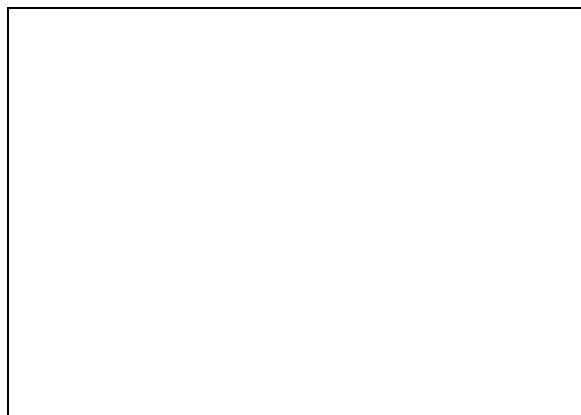
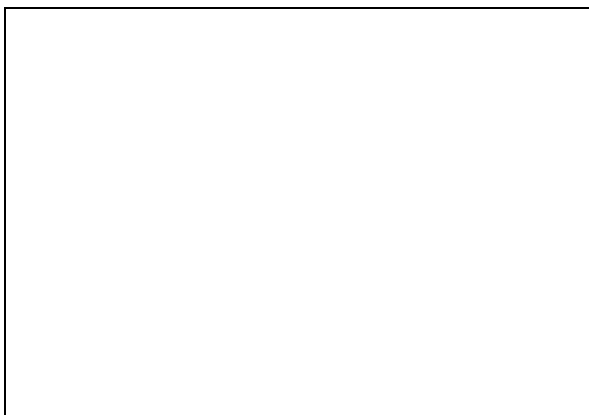


Can # 3: _____

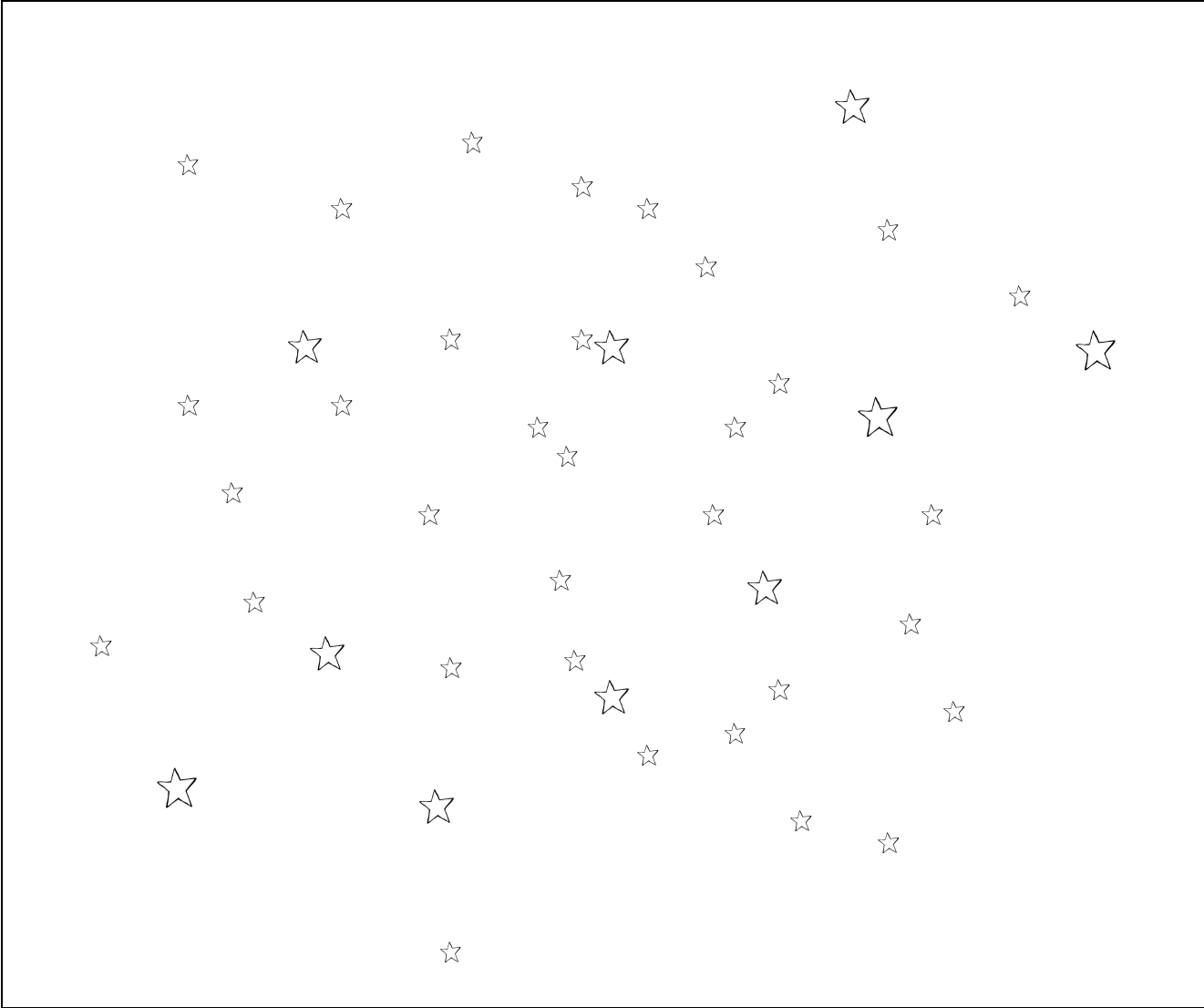


Can #4: _____

Can #5: _____



Make your own constellation and give it a name!



My constellation's name is:
